UNIVERSITY OF NAIROBI

FACULTY OF ARTS

DEPARTMENT OF SOCIOLOGY

ASSESSING FIRE HAZARDS REDUCTION CAPABILITIES IN NAIROBI'S KIBERA INFORMAL SETTLEMENTS

A PROJECT REPORT SUBMITTED TO FACULTY OF ARTS IN PARTIAL FULFILLMENT OF REQUIREMENTS FOR THE AWARD OF MASTER OF ARTS DEGREE IN ADVANCED DISASTER MANAGEMENT

By

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Declaration and Recommendation

Declaration

This research report is my original work and to the best of my knowledge has not been presented to any university for the award of a degree or diploma.

Sign..... date.....

RUTH N. KAMENGERE

This research report has been submitted for examination with my approval as the University Supervisor.

Name:

PROF. MAURI YAMBO

Sign..... date.....

Dedication

I dedicate this research report to my family members for their inspiration throughout my postgraduate studies.

Acknowledgements

I would like to acknowledge the support, advice and tireless efforts of my supervisor Professor Mauri Yambo for the supervision during my research work and in writing of this research project report.

I would also like to acknowledge the assistance provided by the sub-county administrators, institutional-based key informants, and the local opinion leaders within Kibera slums who participated in providing useful insights to the study.

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God Bless you all!

Abstract

Droughts, fires, flood, terrorism, technological accidents, diseases dominate Kenya's disaster profile and epidemics that disrupt people's livelihoods, destroy the infrastructure, divert planned use of resources, interrupt economic activities or retard development. Over the past few years, Kenya has made progress in relation to disaster response and recovery, but not much in disaster reduction. The severity and frequency of recurrent 'everyday' urban risks experienced predominantly by socio-economically deprived residents in sprawling Kibera Slums have been largely under-researched, or accorded little attention by disaster risk specialists in Kenya and beyond.

The broad objective was to assess the fire hazards reduction capabilities in Nairobi's Kibera informal settlement. The study further sought to achieve the following specific objectives: to investigate how fire hazards are managed by the Kibera residents internally vis-à-vis externally by other actors; to investigate prospects for long-term strategies of fire hazard reduction that will bring sustainable solutions and incorporate disaster resilience and mitigation into actions and decisions; and to assess the level of capacity to reduce fire-related hazards among the residents of Kibera Slums.

The study was carried out at within Kibera Slums. This study adopted a case study design. The unit of analysis was the household. The unit of observation was the individual heads of household. A field study was conducted covering 198 households' heads and select key informants. Simple random sampling method was used in the selection of individuals to be interviewed. The study used interviewing as the principal data collection technique. The main tools of data collection were structured interview schedules for key informants and household heads.

The findings established that Kibera residents manage fire hazards using a two-pronged approach. First, hazards are managed at the household level. Second, hazards are managed at the community level which involves the immediate neighbourhood and other external actors. , the findings revealed a range prospects for long-term strategies of fire hazard reduction that will bring sustainable solutions and incorporate disaster resilience and mitigation into actions and decisions for Kibera residents. These include: assistance from external actors; communication and early warning approaches; sensitization on personal and household safety measures; and comradeship. The study was able to reveal the level of capacity to reduce fire-related hazards among the residents of Kibera Slums. The capacities were explored on the basis of three broad categories namely: responsible handling of fire sources, institutional support, equipment, and social networks. In order to enhance fire hazards reduction capabilities in Nairobi's Kibera informal settlement, the study recommended that the government should boost its external support on preparedness; increase the level of awareness on fire hazards management among the members of the community; and introduce measures to reduce the level of dependency by the community to external interventions. This will be achieved through participatory decision-making.

Table of Contents

Declaration and Recommendation ..... **i**

Dedication ..... **ii**

Acknowledgements ..... **iii**

Abstract ..... **iv**

Table of Contents ..... **vi**

List of Tables and Figures ..... **ix**

List of Abbreviations And Acronyms ..... **x**

CHAPTER ONE: INTRODUCTION 1

1.1. Background 1

1.2. Problem Statement 3

1.3 Objectives 6

1.3.1 Broad objective 6

1.3.2 Specific objectives 6

1.4. Scope and Limitation 7

CHAPTER TWO: LITERATURE REVIEW 8

2.1 Review of Empirical Literature 8

2.1.1 Fire Disaster in Kenyan Urban Informal Settlements 8

2.1.2 Triggers of Fire Hazards 12

2.1.3 Disaster Risk Reduction in Kenya 14

2.1.4 Disaster Risk Reduction in Kenyan Urban Informal Settlements 14

2.1.5 Communities' Disaster Response 16

2.2 Review of Theoretical Literature 17

2.3 Research Questions 25

2.4. Conceptual Framework 25

CHAPTER THREE: METHOD 27

3.0. Introduction 27

3.1. Study Area 27

3.2. Research design 28

3.3. Unit of Analysis 28

3.4. Unit of Observation 29

3.5. Sampling Procedures and Techniques 29

3.6. Data Collection 31

3.7. Data Analysis 33

3.8. Ethical Criteria 35

CHAPTER FOUR: DATA ANALYSIS AND INTERPRETATION 36

4.1. Introduction 36

4.2. General Profile of the Respondents and Households 36

4.3. Capacities to Reduce Fire-Related Hazards 41

4.4. Internal Measures to Reduce Residents' Vulnerability to Fire-Related Hazards 44

4.5. Coping Strategies and Identifiable Sustainable Solutions 46

CHAPTER FIVE: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS 50

5.1. Introduction 50

5.2. Summary of Key Findings 50

5.3. Conclusions 53

5.4. Recommendations 56

5.5. Areas for Further Research 57

REFERENCES 59

KIAMBATISHO I: BARUA YA KUJIJULISHA **63**

KIAMBATISHO II: RATIBA YA MAHOJIANO KWA WAKUU WA JAMII **64**

KIAMBATISHO III: KIONGOZA MAHOJIANO KWA WATOA HABARI WAKUU **69**

APPENDIX I: LETTER OF INTRODUCTION **71**

APPENDIX II: INTERVIEW SCHEDULE FOR HOUSEHOLD HEADS **72**

APPENDIX III: INTERVIEW GUIDE FOR KEY INFORMANTS **77**

APPENDIX IV: TABLE OF RANDOM NUMBERS **79**

APPENDIX V: THE RESEARCH PERMIT **81**

List of Tables and Figures

List of Tables

Table 4.4: Total Household Size and Adults Aged over 18 Years 37
Table 4.2: Nature and Adequacy of Ventilations for Dwelling Structures 38
Table 4.3: Highest Level of Education Attained by Sample Respondents 39
Table 4.4: Multiple Responses Analysis on Sources of Light Energy 40
Table 4.5: Multiple Responses Analysis on Sources of Cooking Energy 40
Table 4.6: Effectiveness of Various Tools applied to put out Fire 42
Table 4.7: Responses by Residents during Fire Alarms 44
Table 4.8: Fire Hazards Reduction Capabilities at Household Level 45
Table 4.9: Level of External Assistance 46
Table 4.10: Ways of Disseminating Fire Alarms in Kibera Slums 47
Table 4.11: Extent to which Mitigation Measures have been enforced 48

List of Figures

Figure 2.1: The Conceptual Model for Fire Hazards Reduction Capabilities 26
Figure 3.1: The Study Area – Kibera Slums Region 28

List of Abbreviations And Acronyms

NDOC - National Disaster Operation Centre

KRCS - Kenya Red Cross Society

OCHA – Office for the Coordination of Humanitarian Affairs

UNDP - United Nations Development Programme

DRR - Disaster Risk Reduction

IRIN - Integrated Regional Information Networks

UNISDR - United Nations International Strategy for Disaster Reduction

WCDR - World Conference on Disaster Reduction

ISDR - International Strategy for Disaster Reduction

DFID - Department for International Development

G4S – Group 4 Security

CHAPTER ONE: INTRODUCTION

1.1. Background

Over the past few years, Kenya has made progress in relation to disaster response and recovery, but not much in disaster reduction. This progress became more evident and needful after the disasters due to El Nino in 1998, when the government decided to launch the NODC that was charged with the management of disasters in Kenya. Later, from 2006, the Government embarked on the development of a disaster management draft policy that came into effect in 2009.

According to the UN Human Settlements Programme (UN-Habitat 2009:23), 60 percent of Nairobi's population lives on 5 percent of the land. The city's overcrowded slums and informal settlements, constructed from cheap materials like corrugated iron sheets and connected to hazardous electricity lines, are particularly vulnerable to fire. Access roads are few, making passage difficult for fire trucks.(UN-HABITAT, 2009:23). Group 4 Security(G4S), one of the security firms running private fire engines blames most of the unsuccessful firefights on the government's poor links. "Access to these areas (slums) is limited and even after we acess, there was no co-ordination on the part of the government," said Clive Lee, G4S managing director. (UN-OCHA, 2011:18).

Fires are not the only risk prevalent in low-income urban areas. UN/OCHA (2011:20 and 33) highlights terrorism attacks, floods, social conflicts, disease outbreaks, insufficient access to water and sanitation, high risk of gender-based violence and food insecurity as some of the major issues facing urban communities. However, the most prevalent of the above-mentioned disasters is fire. This affirmation serves as the background to this study.(OCHA, 2011:20)

On 1st March 2011, a ferocious fire razed to the ground hundreds of houses in three estates in one of Nairobi's Slums: Mukuru Fuata Nyayo, Kayaba and Marigoini estates, leaving one child dead, several people missing and more than 1800 households **[**8,969 people**]** homeless and stripped of their property and livelihoods. (UN/OCHA 2011:25).

Response to urban disasters remains isolated with food aid dominating any form of assistance that victims receive. A visit to the scene by the Kenya Red Cross Society (KRCS), United Nations Office for the Coordination of Humanitarian Affairs (UN/OCHA) and the Minister of State for Special Programmes, Crisis Response Centre and National Disaster Operations Centre revealed a chaotic scenario with hundreds of families displaced to the grounds of a near-by school with little assistance, while they hopelessly watched their smoldering homes. On 3rd March 2011, another fire was reported in Lunga Lunga estates in Nairobi. News posted to media houses on Monday, March 28 2011 by one of fire-fighting partners in Nairobi called ICT Fire and Rescue, affirms that people living in slums make illegal and faulty power connections that has contributed majorly in recent fire incidents, mostly in Nairobi, have brought back the debate on Kenya's disaster preparedness.(OCHA 2011:33)

From January to December 2011, according to Kenya National Disaster Operational Centre (NDOC) says there were 110 fire incidents (up from 70 from October to December 2011), which destroyed close to 5,376 households (UN/OCHA, 2011:25). NDOC, which coordinates response to disaster areas, says that these fires burnt forests, slums and individual homesteads. The Kenya Red Cross (NDOC, 2011) on the other hand has documented 26 fires in the Nairobi slums within year 2011. In September 2011, there was a fuel explosion and fire in Mukuru-Sinai slums of Nairobi where more than 100 people were killed, with several others suffering serious burns. Environmental Emergency Assessment team, comprising OCHA and UNEP experts, which

rushed to the scene concluded that the fire was not caused by pipeline explosion but by industrial accident from a nearby petrol storage facility. In another recent fire incident, on 1st April 2012, fire broke out in Kimathi house which is in the Nairobi Central Business District (NCBD) area. Despite quick response and the building being about 500 meters from the Nairobi fire brigade station, it took more than 4 hours to contain the fire (Daily Nation 2nd April, 2012). Voice of Kibera (2012: 3) reported that Kibera slums had the highest number of fire incidents in Nairobi in the previous two years. The report indicated that 22 fire incidents had been reported in Kibera slums between 2010 and 2012.

1.2. Problem Statement

According to the UN Human Settlements Programme (UN-Habitat), 60 percent of Nairobi's population lives on 5 percent of the land. The city's overcrowded slums and informal settlements, constructed from cheap materials like corrugated iron and connected to hazardous electricity lines, make them particularly vulnerable to fire. Access roads are few, making passage difficult for fire trucks. Fires are not the only risk prevalent in low-income urban areas. OCHA highlights terrorism attacks, floods, social conflicts, disease outbreaks, insufficient access to water and sanitation, high risk of gender-based violence and food insecurity as some of the major issues facing urban communities. According to UNDP (2009:6), human-caused hazards such as periodic fire outbreaks are becoming more frequent and have devastating impacts on the world's densely populated areas. A large-scale hazard that hits a highly vulnerable community with low capacity to cope hence reverses hard-won development gains, entrenches people in poverty cycles and in effect increases vulnerability. According to UNISDR (2008:10), the degree of vulnerability and thus of disaster impacts is defined by social variables such as gender, age, health status, and socio-economic status. A full understanding of such social factors is necessary to identify the underlying causes of disasters and thus try to prevent or mitigate them. Over the recent years, more emphasis has been laid on disaster reduction. This is after many years of

reactive cycle of response to these disasters (UNDP, 2005:19). Disaster risk reduction, commonly referred to as DRR, in most countries has been the responsibility of both urban and rural authorities during the development of disaster management strategies and in their implementation (Pelling and Wisner, 2009:9).

The Kenyan government has recognized the need to pay more attention to disaster risk reduction and climate change as much as it still pays attention to disaster response mechanisms. This shift in policy is documented in a report for Disaster Reduction (2008:14), which noted that the amount of resources used for disaster response in Kenya would have been halved if disaster risk reduction had been used as the key component of disaster management. Other reasons that have necessitated a consideration of disaster risk reduction in Kenya by the government and the stakeholders are duplication of efforts in emergency operations, wastage of resources, and exposure of disaster victims to greater risk and slow recovery, inadequate resources in finance, personnel and equipment (Republic of Kenya, 2010 :14). One of the key components of disaster reduction is preparedness. Preparedness efforts in Kenya's urban areas that have been put in place have less focus on slums than other residential areas despite being the areas with the highest population density. History has shown that, for instance during the 2007/2008 post-election violence, fires were mostly concentrated in slum areas in major towns like Nairobi, Kisumu, Mombasa, Naivasha, Eldoret and other towns around the country (UNDP, 2009:25) .

According to Kenya's national census carried out in the year 2009, the population of the people living in cities had greatly increased. This has consequently put an immense pressure on city infrastructures especially on housing. Urban development has accelerated the proliferation of informal settlements resulting from a massive rural to urban migration in search of livelihoods. The migration has led to declining ecosystems and failing infrastructure, in effect increasing the

vulnerability of these inhabitants to various disasters (IRIN, 2011:10). Nairobi is no different as its population is expected to grow rapidly due to among other factors, uncertainty and unreliability of rural sources of livelihoods like farming. This is due to climatic patterns that have affected negatively on rain and season patterns thus rendering rain-fed farms unproductive. The report further affirms, many countries are beginning to realize that the long-term benefits of more pro-active prevention, mitigation and preparedness which constitute risk reduction measures are largely worth investing in as opposed to emphasizing in response and relief measures.

The severity and frequency of recurrent ‘everyday’ urban risks experienced predominantly by socio-economically deprived residents in sprawling Kibera Slums have been largely under-researched, or accorded little attention by disaster risk specialists in Kenya and beyond. A study by Kikuvi (2011) had sought to assess secondary schools' preparedness on disaster management in the provision of education in Nairobi County, Kenya. Overall, the study concluded that the skills that determine effective disaster management in the provision of education were counseling skills, disaster management skills, life skills, as well as first aid and scouting skills even among the students' body (Kikuvi, 2011: vi). Earlier on, Were and Nyakoa (2010) sought to assess human response to fire occurrences at household and community levels in informal settlements of Mukuru Slums.

In Kibera Slums, residents are at risk from recurrent hazards, such as informal fire, due to prevailing social, political, economic and environmental conditions. This generates situations of increased vulnerability, manifested as severe overcrowding, low levels of fire education as well as a lack of access to basic services, such as water and electricity. This study investigated fire hazard reduction capabilities in Kibera Slums, exploring the differentiated risk profiles of

informal housing types that exist. The research sought to explore how hazards reduction measures triggered at the household level can reduce potential catastrophic outcomes at the settlement level that would otherwise arise due to the high levels of transferred risk. Losses and damage incurred among the residents of Kibera Slums made it urgent to study and understand the risk accumulation processes in this community, and to identify how locally initiated processes can address these risks. There was also a need to explore remedial (or preventive) actions that might be undertaken by central government, local government authorities and NGOs.

1.3 Objectives

The study pursued the following objectives:

1.3.1 Broad objective

The broad objective was to assess the fire hazards reduction capabilities in Nairobi's Kibera informal settlement.

1.3.2 Specific objectives

1) To investigate the strategies as well as level of capacity to reduce fire hazards by the Kibera residents internally vis-à-vis externally by other actors
2) To investigate prospects for long-term strategies of fire hazard reduction that will bring sustainable solutions and incorporate disaster resilience and mitigation into actions and decisions.
3) To assess the level of capacity to reduce fire-related hazards among the residents of Kibera Slums.

1.4. Scope and Limitation

The study was undertaken within Kibera slums. In the first objective, the study sought to explore the strategies applied by Kibera residents in reducing fire hazards; besides their level of capacity to reduce their vulnerability to fire-related hazards. In the second objective, the study was confined to issues of sustainability of fire hazards reduction strategies applied by Kibera residents. The final objective was confined to assessment of household level and community level capacity to reduce fire-related hazards in Kibera slums. Other issues covered in the study included: internal hazards management approaches (community level); external hazards management approaches (by other actors); vulnerability and capacity levels of residents to manage hazards. The study was confined to fire related hazards. Given this limitation, the findings of the study are not generalizable to other informal settlements whose social structures, physical layouts, and histories are likely to be notably different.

CHAPTER TWO: LITERATURE REVIEW

2.1 Review of Empirical Literature

2.1.1 Fire Disaster in Kenyan Urban Informal Settlements

Disasters occurring in the rapidly growing cities in Kenya predominantly affect the economically weakest sections of society. Underlining the fact that "the impact of these disasters and their contribution to poverty are underestimated, as is the extent to which rapidly growing and poorly managed urban development increases risks" (Kamanga, et al. 2003: 193).

Neither the variety of risks nor their often chronic threat to people's lives and development tends to be recognized and acted upon by local governance. A deeply entrenched bias from the side of governments as well as donor communities towards rural areas – regarded as being disaster-prone and at greater risk – exacerbates the situation. As the UN-HABITAT database reveals, in many instances trends and seasonal patterns in risk factors can be determined for different areas. Factors that have proved to drive fire risk up are dwelling density combined with population patterns, as well as lack of social cohesion. Factors such as the composition of a settlement's population – families vs. single households, as well as the origins of the settlement and its inhabitants, are crucial factors that can exacerbate these divisions (Kamanga et al, 2003:193).

Fire risk has been a social reality for some time, in Kenya as well as in other urban developing contexts, and there are indeed some similarities between these various contexts. Even though informal settlements may bear some specific local characteristics, many features are common, seem to suggest that some sort of strategy could be conceived and applied to map, and reduce fire risk in informal settlements (UN Habitat, 2010:40). In some settlements, strong social networks and structures are found. These have usually grown over a significant period and tend to have consistent demographic figures. In most instances, however, urban migration means that

informal settlements experience a high and constant influx of newcomers. Family members already living in the area attract some of these people. This does mean that they will be integrated into an existing structure, but they will also put these structures under additional strain and potential disaster risk. The situation differs dramatically in the case of foreign immigrants and refugees, who are often greeted with hostility and struggle to become integrated (UN Habitat, 2010:40).

Land ownership is another crucial factor to be taken into consideration in the context of fire risk. While the Kenyan government, in the spirit of the new dispensation, has been trying to formalize land ownership and provide tenures, as well as housing subsidy grants (Ministry of Lands, 2011:32), it has revealed that this has also led to the sub-division of households and the erection of new shacks in order to increase the chances of receiving a grant. In other instances, as was observed in *Mukuru kwa Reuben*, one of the slums in Nairobi, this reason resulted in establishment of new shacks in order to put these on the housing register for grants, which further increased density and hence drove up fire risk (UN-HABITAT, 2010:45).

What have often been singled out as the ultimately determining factor for fire risk are chronic conditions of poverty. The example of Mathare slums on the outskirts of Nairobi highlights the fact that socially cohesive communities, even though poor and surrounded by alien vegetation, can be resilient to fire risk and have a lower occurrence rate of fire incidents. There is then neither one single cause, nor one solution, to fire risks in informal settlements. Living conditions in many informal settlements, as well as in formal areas where back yard shacks are rented out to generate extra income, do nevertheless determine the risk patterns. The immediate triggers for these fires will be discussed in the next parts of this study. The underlying root causes in these cases are highly complex, influenced by political affiliations and gender relations. This does

seem to suggest that poverty and living conditions, as well as social and communal networks or the lack thereof, are the issues in greatest need of being tackled as disaster risk reduction measures (UN-Habitat, 2010:12).

A recent study by Murage (2012) sought to assess the factors influencing fire disaster preparedness in the central business District of Nyeri town, Nyeri County. The study assessed how independent variables like level of fire safety awareness, value of investment, nature of investment and municipal fire preparedness bylaws influence fire disaster preparedness. The study found that the level of fire safety awareness is very low and the municipal council does not inspect compliance with fire disaster preparedness bylaws (Murage, 2012: v). Earlier on, Were and Nyakoa (2010) sought to assess human response to fire occurrences at household and community levels in informal settlements of Mukuru Slums. The study by Were (2010: iv) was limited to factors that inform responses during fire breakouts; levels of prioritization when salvaging property; fire information and mitigation levels amongst dwellers; precautionary measures regarding fires taken at household levels; and local methods used to fight the fire and other external responses. Studies focusing on hazard reduction capabilities amongst the slum dwellers in Nairobi are not systematically documented. In addition, for many slum dwellers in Nairobi, it is becoming increasingly apparent that the vulnerability to 'everyday' environmental hazards such as localised flooding, informal fire and exposure to degraded and polluted environments is routinely and increasingly threatening the livelihood security of impoverished households, exacerbating already high levels of poverty.

Omedo (2010: iv) carried a study on vulnerability of urban informal settlements to environmental hazards, a case study of Korogocho in Nairobi. The study was conducted in Korogocho as a response to the emerging world view that recognizes urban informal settlements

as areas exposed to numerous environmental hazards and disasters. This is particularly evident in Kenya where the issue of proliferation of informal settlements and urban sprawl has been on the rise (Omedo, 2010: iv). The study results revealed that Korogocho is highly vulnerable to disease related hazards, floods, fires and droughts which culminate in famine and general insecurity. The lack of a cogent land-use plan for the area further complicates the problem. The study identified a number of challenges in disaster risk identification, management and reduction in Korogocho. These include the fact that urban disasters and risks have been neglected, lack of an early warning plan, weak institutional arrangements to support residents, lack of political goodwill and insufficient knowledge, experience and capacity by the residents (Omedo, 2010: iv).

A study by Kamau (2007: vi) sought to assess the challenges in preventing and fighting structural fires in Nairobi's informal settlements. Specifically the study sought to identify policy guidelines in Kenya and the extent to which they have been violated within the informal settlement sector, establish the extent to which the violations of these guidelines lead to vulnerabilities to fire hazards in the informal settlements, assess the capacity of the community and other support systems to respond to fires, and examine the mitigation and preparedness strategies that have been put in place. The study established that despite the high cases of fire incidents in the informal settlements, about 95% of the residents did not consider fire security to be an immediate priority although important (Kamau, 2007: vi). Due to low incomes, fire incidents are considered as mere bad lack for which resources for prevention should not be spared. Lack of fire prevention measures really makes the informal settlements vulnerable to fire hazards. The study established that there were various challenges that were faced when it came to preventing structural fires in Nairobi's informal settlements. These included the lack of a fire policy and a fire act that would give guidelines to the fire personnel on how to go about

responding and fighting structural fires in the informal settlements. The fire act would also empower the fire personnel in enforcing fire regulations in the informal settlements. Another challenge reported was the lack of access to slum areas which hampered effective employment of fire tenders whenever they reported to assist in controlling the fires. The main challenge in handling fire within informal slums of the city has been lack of adequate capacity to handle incidents when they arise. The first research question that guided the study in this aspect was hereby posed:

Research Question 1:

What specific capacities to reduce fire-related hazards can we discover among the residents of Kibera Slums?

2.1.2 Triggers of Fire Hazards

A large proportion of fires start at night and the majority occur over weekends. One would assume the importance of nighttime to be related to the increased use of candles for light and open fires and paraffin stoves for cooking. In addition, there is likely to be more damage sustained during nighttime fires because responses are likely to be slower if people are asleep. The fact that many fires occur at night over the weekends tends to imply that there might be heightened levels of carelessness and negligence during these periods and this may have connections with socializing, leaving homes – and possibly even children – unattended, and with drunkenness: people knocking over candles or stoves, or falling asleep without extinguishing them (UN/ISDR, 2009:13).

With regard, the triggers of fires, according to UN-Habitat (2010: 34) the data shows that in the majority of cases the source is unknown. The June 2011 Kibera fire event provides an interesting example of the controversy that surrounds the causes of these devastating fires. Despite the trigger being officially recorded as unknown, stories abound within the community. There seems

to be agreement that a woman leaving her dwelling unattended started the fire, but the details vary considerably. Some say she was drunk at the time and left her home to return to the drinking den, others say she left to visit neighbors or a boyfriend, and some believe that she left either a child or two children unattended. Some claim that it was a candle that she left burning that started the fire while others maintain that it was paraffin stove. According to National Disaster Operation Center monthly report (2011:33) the reaction of the residents to this fire event was one of focused anger. They felt the need to identify a culprit in order to lay blame and administer suitable punishment (UN-Habitat, 2010:43)

A particularly bizarre feature of the statistics relating to the incidence of stove explosions is that of the ten such occurrences recorded between 1995 and 2004, eight were in 1996 and the other two in 1998 (NDOC, 2008:3). Cigarettes are the third highest of the identified causes of fires and yet very few of the Kibera residents mentioned this to the researchers as a cause or as a concern. According to the UN-HABITAT statistics, electrical circuit failure is the second lowest cause of fires, yet both media reporters and residents and Fire -fighters frequently refer to the risk associated with illegal electricity connections. However, it is important to remember that because of the large number of unidentified triggers these trends are not by any means definitive. More fire incidents occur during a period of very high temperatures and dry conditions, with a strong wind fanning the flames, which increases the severity and extent of the fire. There are links to assertion that there are a majority of fires related to drunkenness and leaving a burning candle or stove unattended. Most fires take place on a weekend night and could also account for the delayed response as it takes more than six hours to get the blaze under control, with problems of access for fire service vehicles, limited availability of water and rising levels of panic and disorders all hampering response activities. The speed with which fire spreads means that very

few people have time to remove much of their possessions from their homes.(UH-Habitat, 2010:50)

Most people affected lost everything according to NDOC (2011:23). Relief assistance in the aftermath of the event was extensive with many companies, organizations, institutions and government entities donating money and necessary items and/or providing essential services, but despite this some losses were of things that could not be replaced. For example, for many children it was not just schoolbooks – which could be replaced with new books that had been donated – but all the work that they had done in those books that was lost (NDOC, 2011:45). Triggers of fire hazards expose the residents to associated risks and disasters.

2.1.3 Disaster Risk Reduction in Kenya

Reducing disasters is important in achieving the Millennium Development Goals, particularly the overriding goal of halving extreme poverty by 2015. It is even most important in achieving Kenya's Vision 2030. The DRR programme started in January 2005 after the devastating impact of tsunami where more than 250,000 people in Asia were killed. This led more than 160 countries to sign on to an action plan, The Hyogo framework for action, to build global resilience to disasters. The framework places primary responsibility on national governments to achieve resilience through DRR (UN-ISDR, 2009:25)

2.1.4 Disaster Risk Reduction in Kenyan Urban Informal Settlements

Informal settlements are characterized by unguided housing densification and spatial disorderliness that inhibit provision of basic services, for instance portable water and access roads. Some of the informal settlements are located in environmentally hazardous areas including flood prone areas and steep slopes. The emergence and growth of these settlements is to the largest extent characterized by unguided land acquisition and housing development process.

The increasing number, size and density progressively subject residents in these settlements to small and big disasters such as fire accidents, poor safety and diseases. Increasing housing density have resulted into poor sanitation, solid waste disposal and collection, vehicular inaccessibility in case of emergencies such as fire accidents and low level of service provision in terms of education, health and security, which together may compound into increased exposure to health, economic and environmental risks among urban dwellers. Since the informal sector is still inadequately regulated and poorly serviced, it is characterized by insecurity in terms premises for their operations, irregular income, insecurity of properties and lack of public financial support and thus leading to possible accumulation of economic, health, social and environmental risks. Some informal sector activities have encroached road reserves, resulting into reduced road capacity and thus causing traffic accidents and/or jams. Recreational grounds and areas reserved for community facilities such as schools, markets, churches and mosques have also become targets for informal sector activities locations. In many occasions, conflicts have emerged between co-users and where relocation has taken place, informal sector operators have been the losers. In can be argued that the growth of the unmanaged informal sector has led into risk accumulation related to traffic accidents, theft, insecurity, loss of properties and capital, conflicts among users of the same locations, noise and air pollution (UN-ISDR, 2009:25).

Urban risks such as those related to health, economy, and social and environmental which are more or less frequent in urban Nairobi have not been comprehensively studied in a participatory and integrated approach and documented. Lack of such an information and experience limits the mainstreaming of interventions to manage the risk accumulation process within the urban planning and risk management systems in Kenya.

Processes that generate the existing conditions of risk and vulnerability in urban areas are, if anything, known to planners and decision makers in an isolated manner, yet such processes seem to work together in an integrated way. For instance, it is difficult to separate water supply issues from liquid and solid waste management and the overall city layout, vehicular accessibility, population density and governance capabilities at city and community levels. Particular risky situation is an integral part of a holistic and dynamic relationship. Without credible knowledge on this synergy, it is rather difficult to effectively manage the inevitable environmental, spatial, social and economic transformations resulting from the irreversible urbanization. (UN-ISDR, 2009:26)

The proposed research is justified by the need to monitor the risk accumulation processes in order to establish the level of technology and resources needed to minimize effects of disasters on people and properties or in dealing with disaster after they have occurred. By providing more knowledge on the risk accumulation process it is possible to chart out a more effective urban planning and disaster management policies and practices. Potential beneficiaries of the findings from the study are therefore: policy makers and planners, local government authorities, communities and individuals with or without properties in urban areas.

2.1.5 Communities' Disaster Response

Traditional emergency management/civil defence thinking makes two misleading assumptions about communities. First, it sees other forms of social organization (voluntary and community-based organizations, informal social groupings and families) as irrelevant to emergency action. Spontaneous actions by affected communities or groups such as search and rescue are viewed as irrelevant or disruptive, because the authorities do not control them. (UN-ISDR, 2009:27). The second assumption is that disasters produce passive 'victims' who are overwhelmed by crisis, or dysfunctional behavior (panic, looting, self-seeking activities). They therefore need to be told

what to do, and their behavior must be controlled – in extreme cases, through the imposition of martial law. There is plenty of sociological research to refute such 'myths'. (UN-ISDR, 2009:29)

An alternative viewpoint, informed by a considerable volume of research, emphasizes the importance of communities and local organizations in disaster risk management. The rationale for community-based disaster risk management that it responds to local problems and needs, capitalizes on local knowledge and expertise, is cost-effective, improves the likelihood of sustainability through genuine 'ownership' of projects, strengthens community technical and organizational capacities, and empowers people by enabling them to tackle these and other challenges. Local people and organizations are the main actors in risk reduction and disaster response in any case (UN-ISDR, 2004a:33).

2.2 Review of Theoretical Literature

Hazard is commonly defined as a danger or risk, and as a potential source of danger (McKean 2005: 614). In a broader definition, hazard is an event, a condition, or a human activity, with a potential of causing a threat to people and to the physical environment, and that may result in a disaster. In most cases, its origin defines the hazard, such as natural or man-made hazards. Hazard mitigation on the other hand is typically defined as "policies and actions taken before an event which are intended to minimize the extent of damage and injury when an event does occur" (Drabek, Mushkatel, and Kilijanek, 1983: 12). Of the four key disaster phases or management tasks (mitigation, preparedness, response, and recovery), mitigation has been studied the least (Drabek 1986: 14) and is probably the least well understood.

A review of literature (for example Petak, 1984: 289; Alesch and Petak, 1986: 56) indicates that three sets of theoretical approaches have been dominant in hazards and disaster research: *hazards paradigm* and the technocratic concepts of risk; *vulnerability paradigm* and social

conceptualization of disaster; and *cultural theory* of social construction of risk. There is a clear division between these three approaches in discussing what constitutes a disaster or a risk, and what should be done about it. The hazard approach concentrates on the existence of an external-agent (in the case of natural disasters, the external force being the natural forces), which triggers a disaster. Accordingly, the disaster takes society from a state of normalcy, to a state of emergency and recovery. The understanding that the existence of hazard adjustments can mostly be achieved through specialized researches of the scientists, engineers and technocrats, takes the discourse to a group of experts, away from society who is left at a passive state. On the other hand, the argument that, "human-beings choose how they cope with or adjust to extreme events" brings an additional element of blame to the disaster victim, in addition to the equivalent use of the term hazard as risk, by government officials in order to avoid blame. A critique of this approach, Bogard (1988:154) argues: "The unpredictability of disaster, its perceived externality to the routine of social life, its characterization as an 'act of God,' all entered into and reinforced this idea."

The vulnerability approach takes disaster beyond being merely an external impact of a physical event, in a bounded time and place. It rejects the modernization theory, as favored with the technocratic and scientific solutions of the hazards paradigm, and its postulate that outside interventions and "development" is a solution to the problems of the developing countries. Rather, through studies in fieldwork, theorists of vulnerability argue that these outside interventions can be "counter-productive" (Oliver-Smith, 1989:12, 1999a:261). According to these theorists, vulnerability is a result of the social, economic, cultural, and educational conditions embedded in societies. This attained vulnerability is also a result of social constructions, and it accumulates over time as an understanding of political ecology, which moves towards a neo-Marxist critical theory. The political ecology argues that societies both

shape and are shaped by the environment, in a way following Henri Lefebvre's (1991:121) argument that space is both socially produced and productive and that it evolves historically rather than being created separately from society. The political vulnerability approach takes this understanding to a global level and argues for the global political forces that influence marginalization, redistribution of wealth and power, particularly, in developing countries with a history of colonization. Along the same lines, influenced by globalization and based on critical theory, critiques of modernity argue that risk is a characteristic of modern day industrial society (such as technological risks), but which could also be applied today to the study of other human-induced hazards, such as those that result from environmental land degradation.

The social construction of disaster in cultural theory reveals itself in several levels, from pure semiotics to socio-semiotics. Some theorists in disaster research argue that disasters—"even their objective properties such as severity or scope of impact"—are purely socio-cultural constructions, and that these constructs are a way of maintaining power by scientific and political discourse (Lefebvre, 1991: 143; Oliver-Smith, 2004:18). This study is grounded on the *hazards approach.* In Kibera Slums, fire hazards have in the past triggered fire disasters with devastating consequences to human livelihoods. The theories most relevant to this study include: the risk society theory, and the coping theory.

2.2.1. Risk Society Theory

Risk society is a term that emerged during the 1980s to describe the manner in which modern society organizes in response to risk. The term is closely associated with several key writers on modernity, in particular Beck (1992) and Giddens (1999a, 1999b). The term's popularity during the 1990s was both as a consequence of its links to trends in thinking about wider modernity, and also to its links to popular discourse, in particular the growing environmental concerns

during the period (Caplan, 2000: 7). According to Giddens (1999a:3), a risk society is "a society increasingly preoccupied with the future (and also with safety), which generates the notion of risk," whilst Beck (1992: 21) defines it as “a systematic way of dealing with hazards and insecurities induced and introduced by modernization itself” (Beck, 1992: 21)". Beck (1992:50) defined modernization as, "surges of technological rationalization and changes in work and organization, but beyond that includes much more: the change in societal characteristics and normal biographies, changes in lifestyle and forms of love, change in the structures of power and influence, in the forms of political repression and participation, in views of reality and in the norms of knowledge. In social science's understanding of modernity, plough, the steam locomotive and the microchip are visible indicators of a much deeper process, which comprises and reshapes the entire social structure."

Beck and Giddens both approach the risk society firmly from the perspective of modernity, "a shorthand term for modern society or industrial civilization. modernity is vastly more dynamic than any previous type of social order. It is a society which unlike any preceding culture lives in the future rather than the past" (Giddens, 1999b: 94). They also draw heavily on the concept of reflexivity, the idea that as a society examines itself, it in turn changes itself in the process. In classical industrial society, the modernist view is based an assumption of realism in science creating a system in which scientists work in an exclusive, inaccessible environment (Beck, 1992: 51). The definition of a risk society and the aspects of modernization clearly match the current state of affairs in Kibera Slums.

Giddens and Beck argued that whilst humans have always been subjected to a level of risk - such as natural disasters - these have usually been perceived as produced by non-human forces. Modern societies, however, are exposed to risks such as pollution, newly discovered illnesses,

crime, that are the result of the modernization process itself. Giddens defines these two types of risks as external risks and manufactured risks (Giddens, 1999a: 6). Manufactured risks are marked by a high level of human agency involved in both producing, and mitigating such risks. Fire hazards belong to this category. As manufactured risks are the product of human activity, Giddens and Beck argue that it is possible for societies to assess the level of risk that is being produced, or that is about to be produced. This sort of reflexive introspection can in turn alter the planned activities themselves (Giddens, 1990: 8). Hazards arising from human activity and incidents (such as fire) can be reduced if proper measures are put in place. Modernization has led to the invention of several approaches through which hazards are mitigated or reduced. Modernization and globalization have both taken on a life of their own and led to rediscovery of the openness of human actions. Risk society asserts that the move towards a new modernity ought to enhance understanding on how prepared informal settlements are in dealing with risks like fire occurrences, including reducing vulnerability to potential hazards. To achieve this, the following research question was posed:

Research Question 2:

What are the internal measures applied to reduce Kibera residents' vulnerability to fire-related hazards?

The general approach underlying most work on mitigation is an open-system or equilibrium perspective “that stresses the reactive character of social mitigation in bringing hazardous situations back to 'normal'” (Bogard 1988: 148). The most explicit and detailed examples of this approach can be found in the work of Gilbert White (White 1974: 41; White and Haas 1975: 16) and others like Mileti, Drabek, and Haas (1975:9); who see societies and communities primarily as human systems that develop ways of responding to disruption. Using this general framework, Mileti (1980: 23) developed a typology of adjustments, many of which are mitigation strategies, but some of which involve preparedness and response. On the basis of an extensive review of the literature, he went on to construct a general multivariate model to explain how these risk-mitigating adjustments are selected. The model incorporates three categories of variables: (1) factors related to the perception of risk (e.g., ideas about disaster causation, experience with the hazard); (2) characteristics of the social structure of the affected unit (e-g., capacity to implement policy, as determined by social structural factors); (3) the incentives and disincentives that operate between different levels in the social structure (e.g., economic and regulatory power).

Coping theorists have argued that organisms resist change and react to external challenges by mounting responses that maintain their equilibrium. There are equivalents at many levels: at the cellular level, maintaining homeostasis is the role of the immune system; at the organ level the endocrine and limbic systems are involved; at the psychological and behavioural levels various coping processes are involved, while at the social level norms and social sanctions maintain order (Orr, 1986: 175). Coping may be defined as thoughts or actions designed to resolve or mitigate a problematic situation. Coping is not a fixed attribute, but is the dynamic capacity to apply suitable methods to control, avoid or prevent distress. It is also a process that involves appraisal and reaction: we do not use identical responses in every situation. Coping refers to the

management of responses, not mastery over stimuli. It normally refers to managing unusual demands that tax, even exceed, a person's resources (West, Lyon and Gardner, 1980: 1083).

The work of Menninger (1954:414), and more recently Haan (1969:16) and Vaillant (1977:64), drew on a hierarchical approach to coping derived from the developmental psychoanalytic formulation. Some defenses were said to be healthier than others – presumably as a result of stress or trauma. For example, Haan (1969: 17) proposed a tripartite hierarchy with coping as the most healthy and developmentally advanced process of adaptation, defense as a neurotic process, and ego-failure as the most severely regressed and perhaps psychotic adaptive process. In the late 1970s (Lazarus, 1981: 177) a major new development in coping theory and research occurred in which the hierarchical view of coping, with its trait or style emphasis, was abandoned in favor of a contrasting approach, which treated coping as a process. From a process perspective, coping changes over time and in accordance with the situational contexts in which it occurs (Lazarus, 1993: 235). Dwellers of urban informal settlements such as in Kibera experience challenges in coping with hazards due to their socio-economic status. A majority of households live under abject poverty with limited resources to support any mechanisms that they may seek to adopt. At times, interventions by non-state actors come handy for the residents.

From a process standpoint, coping is defined as ongoing cognitive and behavioral efforts to manage specific external and/or internal demands that are appraised as taxing or exceeding the resources of the person (Lazarus, 1993: 235). In this case, the hazardous situations arising from fire incidents present the demand conditions for Kibera residents. The definition can be simplified – though with a loss of some information – by saying merely that coping consists of cognitive and behavioral efforts to manage psychological stress. From a measurement and research standpoint, this type of formulation emphasizes that the coping effort is independent of

the outcome so that its role in influencing adaptational outcomes can be independently assessed. Present coping efforts lead to formulation of future coping and mitigation strategies (Lazarus, 1993: 236).

According to Folkman and Lazarus (1990: 313), the theory of coping as a process emphasizes that there are at least two major functions of coping namely, problem-focused and emotion-focused. The distinction is subscribed to widely by coping researchers. The function of problem-focused coping is to change the troubled person-environment relationship by acting on the environment or oneself. The function of emotion-focused coping is to change either a) the way the stressful relationship with the environment is attended to (as in vigilance or avoidance) or b) the relational meaning of what is happening, which mitigates the stress even though the actual conditions of the relationship have not changed (Folkman and Lazarus, 1990: 313). The latter involves a more benign or less threatening reappraisal, as illustrated, for example, in denial and distancing. Our present study is grounded on the problem-focused approach to reduction of fire related hazards within informal settlements.

Koeske et al (1993:322) reported on a four wave longitudinal study whereby they looked at the coping strategies used by a sample of new intake social workers in dealing with their clients. Overwhelmingly, the evidence pointed to the benefits of coping strategies over the predominant mode of avoidance strategies. However, even those in the sample who predominantly used controlled coping, also used avoidance strategies at times. In their summary, Koeske et al (1993:334) highlighted how both behavioural and cognitive controlling strategies were used and how these were interrelated. They hoped that if behaviour was controlled, presumably it was cognized first and, conversely, if a cognitive shift was utilized, behaviour was also affected. Emphasis is placed on flexibility of strategies to provide the most effective results of coping'. It

is likely that while facing imminent dangers from fire-related hazards, slum dwellers may apply particular coping strategies in particular situations. The success of the application of any strategy is likely to be determined by the number of actors involved in mitigation. To establish the nature of strategies applicable to fire-related hazard reduction in Kibera slums, the following question was posed:

RQ3: What short-term and long-term coping strategies have been used to bring sustainable solutions and incorporate fire disaster resilience and mitigation into actions and decisions among Kibera residents?

2.3 Research Questions

The study sought to answer the following questions

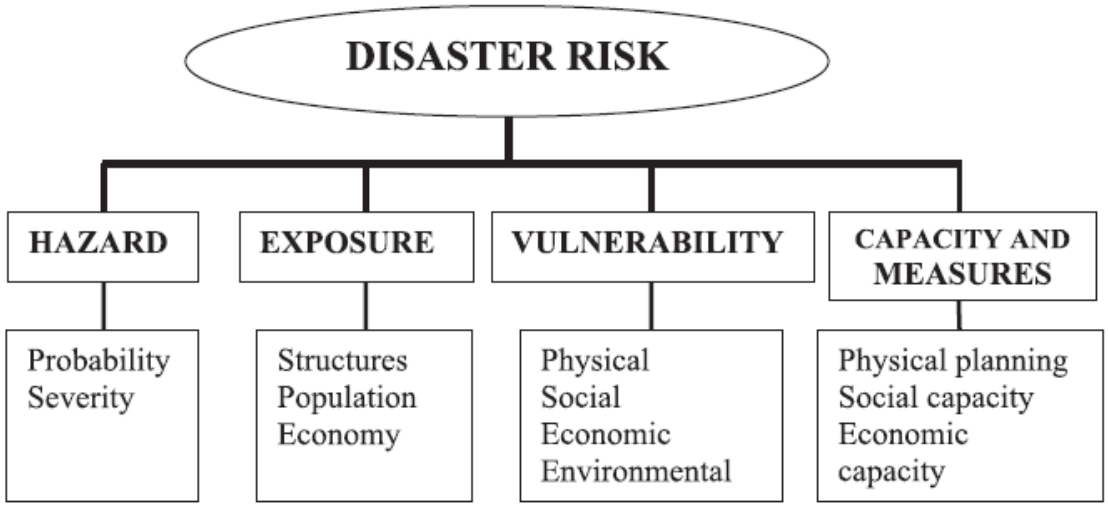
1. What specific capacities to reduce fire-related hazards can we discover among the residents of Kibera Slums?
2. What are the internal measures applied to reduce Kibera residents' vulnerability to fire-related hazards?
3. What short-term and long-term coping strategies have been used to bring sustainable solutions and incorporate fire disaster resilience and mitigation into actions and decisions among Kibera residents?

2.4. Conceptual Framework

The conceptual framework of the current study is informed by the definition of vulnerability within the framework of hazard and risk. The disaster risk community defines vulnerability as a component within the context of hazard and risk. This school usually views vulnerability, coping capacity and exposure as separate features. To illustrate this, the definition of risk within the disaster risk framework by Davidson (1997:5), adopted by Bollin et al. (2003:67), is applied.

Davidson's (1997:5) conceptual framework, adopted by Bollin et al. (2003:67), is shown in Figure 2.1. It views vulnerability as one component of disaster risk. The conceptual framework distinguishes four categories of disaster risk: hazard, exposure, vulnerability and capacity measures (Figure 1.4). In assessing fire hazards reduction capabilities in Nairobi's Kibera informal settlements, it would be important to assess the sources of fire hazards; the level of exposure at the household levels; the extent of vulnerability to the communities; and the capacity to mitigate against the hazards at both the household and community levels.

Figure 2.1: The Conceptual Model for Fire Hazards Reduction Capabilities



Source: Adapted from Davidson (1997: 5); and Bollin et al. (2003: 67).

Figure 2.1 views risk as the sum of hazard, exposure, vulnerability and capacity measures. While hazard is defined through its probability and severity, exposure is characterized by structures, population and economy. In contrast, vulnerability has a physical, social, economic and environmental dimension. Capacity and measures – which seem to be closely related to the subject of coping capacity – encompass physical planning, social capacity, economic capacity and management.

CHAPTER THREE: METHOD

3.0. Introduction

This chapter focuses on the research design used in the study. The issues described in this chapter includes the target population, the sampling techniques, the research design, a description of instruments or tools to be used to collect data, sample size and the techniques used in data analysis.

3.1. Study Area

The study was carried out at within Kibera Slums. Kibera is a division of Nairobi Area, and neighbourhood of the city of Nairobi, located 5 kilometres (3.1 mi) from the city centre. Kibera is the largest slum in Nairobi, and the second largest urban slum in Africa. The 2009 Kenya Population and Housing Census reports Kibera's population as 170,070 and is divided into 13 villages, namely Gatwekera, Kanbimuru, Kianda, Kisumu Ndogo, Laini Saba, Lindi, Makina, Mashimoni, Olympic, Raila, Silanga, Soweto East, and Soweto West. Conditions in Kibera are extremely poor, and most of its residents lack access to basic services, including electricity and running water. Fire incidence has been a matter of concern in the slums. In the last two years, 22 fire incidence have been reported within Kibera slums alone. (Voice of Kibera, 2012)

Figure 3.1: The Study Area – Kibera Slums Region

Source: Kamengere (2012)

3.2. Research design

This study adopted a survey design. A survey approach was necessary considering the nature of the target respondents. The survey design was also used as the research entailed collecting of views and opinions from respondents on fire hazards reduction capabilities as it is at the moment. According to Babbie (1989:46) surveys are well suited to the study of individual attitudes while Wiersma (1985:102) notes that survey research is conducted to determine the status quo and gathering of facts rather than manipulation of variables. The required data was obtained through in-depth interviewing and document analysis.

3.3. Unit of Analysis

According to Mugenda and Mugenda (1999:14), units of analysis are individual units about which or whom descriptive or explanatory statements are to be made while a unit of observation is the subject, object, item or entity from which one measures the characteristic or obtain the data required in the research study. In this study, the unit of analysis was the household.

3.4. Unit of Observation

In this study, the unit of observation was the individual head of household. This covered individuals aged 18 years and above. In times of fire hazards, household heads and adult members are usually in the front line to initiate responses.

3.5. Sampling Procedures and Techniques

According to Singleton (1988:137), sampling design is that part of the research plan that indicates how cases are to be selected for observation. In this study, simple random sampling method was used in the selection of individuals to be interviewed. Simple random sampling ensures that every household in the population has an equal chance of being included in the sample. The total number of households in the 13 villages was determined for use in randomised sampling. According to the Kenya National Bureau of Statistics census results (2009), the 13 villages have 1,977 households (See Table 3.1 below). A sample of 10% of the total households was then drawn from each of the villages. According to Kothari (2008: 64), samples of descriptive studies are considered adequately representative if they are done above 10% of the target. A total of 198 household heads were targeted. The table of random numbers (See Appendix IV) was used to aid random selection of the households.

Table 3.1: The Sampling Matrix

Village	No. of households	Sample size
Gatwekera	212	21
Kanbimuru	57	6
Kianda	166	17
Kisumu Ndogo	163	16
Laini Saba	168	17
Lindi	175	18
Makina	270	27
Mashimoni	115	11
Olympic	64	6
Raila	49	5
Silanga	223	22
Soweto East	193	19
Soweto West	122	12
TOTAL	**1977**	**198**

Source: Computations from Census results KNBS (2009)

In addition, the researcher interviewed selected key informants. The Key informants comprised the District Social Development Officer (DSDO); District Development Officer (DDO); the District Commissioner; leaders of faith-based organizations; representatives of humanitarian agencies; and opinion leaders. The DSDO advises on strategies to encourage the participation and involvement of non-governmental organizations (NGOs), community-based organizations (CBOs) and other community-based groups as well as ensuring that the community special programmes are operating effectively. The DDO is responsible for providing feedback to the District Development Committee (DDC) on the activities and progress of the various intervention measures being implemented by both the state and non-state actors. The District Commissioner assists in community mobilisation. Leaders of faith-based organizations; representatives of humanitarian agencies; and opinion leaders are involved in day-to-day interactions with the households' heads.

3.6. Data Collection

The study sought to gather primary data. The first research question sought to adduce evidence on what specific capacities to reduce fire-related hazards that could be discovered among the residents of Kibera Slums. Data on this was gathered through semi-structured open-ended and closed questions. Open-ended questions helped to deeply interrogate the opinion of respondents. The data was provided by the household heads. The second research question sought to adduce evidence on what internal measures could be applied to reduce Kibera residents' vulnerability to fire-related hazards. Data on this was gathered through semi-structured open-ended and closed questions. Open-ended questions helped to deeply interrogate the opinion of respondents. The data was provided by the household heads and the key informants. The third research question sought to interrogate short-term and long-term coping strategies that could be used to bring sustainable solutions and incorporate fire disaster resilience and mitigation into actions and decisions among Kibera residents. Data on this was gathered through in-depth interviewing of the key informants. The household heads supplemented the information through the recommendations that arose.

The study used interviewing as the principal data collection technique. The main tools of data collection were structured interview schedules for key informants and household heads. A structured interview schedule was administered to the selected key informants. The interviews contained both open and closed-ended questions. The researcher personally administered the interviews with help from two local research assistants who were trained as enumerators. The researcher utilised the *Kiswahili* interview schedule for the respondents and where the household heads and key informants are more conversant with English, the English interview schedules were utilised. A period of two weeks was allocated to collect data from all the 198 sampled respondents and the key informants. The respondents were assured that strict confidentiality was

to be maintained when dealing with their responses. Table 3.2 below shows how each of the research questions was responded to from the interview guides (see appendix).

Table 3.2: The Research Questions Response Matrix

Research Question	Data Sources	Questions
Research Question 1	Household heads and key informants	Household heads interview: Q3, Q5, Q6, Q11, Q13, Q14, Q15, Q22, Q23, Q24; Key informants guide Q6
Research Question 2	Household heads and key informants	Household heads interview: Q19, Q21, Q23, Q25-Q30; Key informants guide Q7
Research Question 3	Household heads and key informants	Household heads interview: Q31 & Q32; Key informants guide Q8

The table of random numbers (see appendix) was used to guide the random sampling of the next household unit whose owner was selected for interviewing. The day of the week was used to determine the starting row and column from which the first random integer to be used was picked. For example, where the interviewing took place on the 3rd day of the week, the third row and the last number of the 5-number set in the third column of the random numbers set was used to pick the 1st household from the sample. For purposes of this selection, the household was numbered or arranged based on their geographical locality such as streets or pathways inside the slums. The exercise continued until the sample size of 198 was exhausted.

Preparation for the field study commenced with hiring of two research assistants. The selection criterion included familiarity in social research methods; university degree in social sciences; past experience in field research within Kibera slums; and flexibility to work for extended hours including weekends. The research assistants were then taken through a one-day induction session where they were briefed of among other things the study objectives; the study area; the

unit of analysis; the sampling methodology; the inclusion/exclusion criteria for respondents; the translated interview guides; and ethical considerations relating to the study. A scheme of work was then drawn up with details on how each research assistant was to undertake the field study. The scope of work for each assistant was defined by the number of household to cover per village. Each research assistant was tasked with covering a minimum seven households per day on weekdays and ten households per day on weekends. This was because in Kibera slums, most of the household heads were found to be away on week days, but well available during early evening hours and weekends. To ensure compliance to the set timelines and standards, the researcher held daily briefing meetings with the research assistants between 6pm and 7pm after they left the field. Any emerging issues and challenges would be discussed and the next course of action agreed upon. The household surveys took 12 days to meet the target of 198 respondents. The remaining two days were allocated for interviews with the key informants.

3.7. Data Analysis

After the fieldwork, before analysis, all the interview schedules were adequately checked for completeness. However, there were no incomplete questionnaires since the research assistants ensured completeness of interviews during the survey stage and self-reporting by the respondents was not applied. The information was codified and entered into a code book for purpose of analysis. Qualitative data was analyzed through segregation of field notes according to codes, categorization of codes according to similarities and organization of data according to study themes from which conclusions are drawn. The data is presented using tables, charts and cross tabulations.

The first research question was analysed by use of descriptive statistics to establish the specific capacities to reduce fire-related hazards that could be discovered among the residents of Kibera

Slums. Data from all the 198 households was collated and summarised using frequency tallies and percentages. The second research question sought to adduce evidence on what internal measures to be applied to reduce Kibera residents' vulnerability to fire-related hazards. SWOT analysis was applied to interrogate the strength and weaknesses of various internal measures proposed by both the household heads and the key informants. Emerging opportunities and threats were also compiled for purposes of informing future policy interventions. Insights into the existing opportunities and threats were also explored.

The third research questions sought to interrogate short-term and long-term coping strategies that have been used to bring sustainable solutions and incorporate fire disaster resilience and mitigation into actions and decisions among Kibera residents. Thematic analysis was applied in responding to this research question.

According to Guest (2012: 11), thematic analysis emphasizes pinpointing, examining, and recording patterns (or "themes") within data. Themes are patterns across data sets that are important to the description of a phenomenon and are associated to a specific research question. The themes become the categories for analysis. Thematic analysis is performed through the process of coding in six phases to create established, meaningful patterns. These phases are: familiarization with data, generating initial codes, searching for themes among codes, reviewing themes, defining and naming themes, and producing the final report. The cited strategies were grouped into categories based on whether they fit as short-term or as long-term. The logical themes emanating from the responses were used to generate explanations to answer the question. The study achieved a 100% target response rate.

3.8. Ethical Criteria

Ethical criteria such as ensuring confidentiality of responses was respected before the data collection commenced. This was achieved by seeking consent from the household heads (or members present) and ensuring that their names did not appear anywhere in the interview forms. This was necessary because it would encourage the respondents to be honest. No respondent were forced to take part in this study. The authority to visit the respective organization was sought from the respective agencies. In this case, the researcher had telephoned the concerned organizations and obtained clearance from the administrators. A research permit was also sought from the National Council for Science and Technology (See appendix). The permit was used to obtain clearance for field study from the office of the county commissioner (Nairobi) and the local chief's office in Kibera.

CHAPTER FOUR: DATA ANALYSIS AND INTERPRETATION

4.1. Introduction

This chapter presents the data analysis, interpretation, and discussion of the research findings. The chapter examines, categorizes, and tabulates the evidence so as to address the study's research questions. The sample comprised of 198 respondents from the study area and six (6) key informants. The rest of the chapter is organized as follows: Section 4.2 presents the findings on general characteristics of the respondents; Section 4.3 presents findings on specific capacities to reduce fire-related hazards that exist among the residents of Kibera Slums; Section 4.4 presents findings on internal measures applied to reduce Kibera residents' vulnerability to fire-related hazards; and Section 4.5 presents data on short-term and long-term coping strategies that have been used to bring sustainable solutions and incorporate fire disaster resilience and mitigation into actions and decisions among Kibera residents; and Section 4.6 is the chapter summary.

4.2. General Profile of the Respondents and Households

Information on key aspects of the composition of households, including the size of the household, and the number of adults aged above 18 years is presented in Table 4.1. The findings of Table 4.1 indicate that a majority of the sampled households (slightly over 70%) had between one and four members. The average size of the household was found to be 3.67 persons (STD error = 0.16). This slightly concurs with the recent Kenya National Demographic and Health Survey (KDHS, 2009) which established that the mean size of a Kenyan household is 4.2 persons, with rural households being slightly larger on average (4.6 persons) than are urban households (3.1 persons) [Republic of Kenya, 2010 : 14].

These characteristics are important because they are associated with the welfare of the household. Economic resources are often more limited in large households than in small households. Moreover, where the size of the household is large, crowding can lead to health problems as well as increased risks to fire hazards triggers. The findings of Table 4.1 further show that about three quarters of the sampled households (74.7%) had at least two adults aged above the majority age of 18 years. The average number of adults aged above 18 years was found to be 2.28 persons (STD error = 0.11). A fact that there is a widespread presence of adult members across households is an indicator of low vulnerability to, and high capacity to cope with hazards and risks at household level.

Table 4.1: Total Household Size and Adults Aged over 18 Years

Household Size	**Number of Respondents**	**% of the total**
One Member	39	19.7%
Two Members	20	10.1%
Three Members	47	23.7%
Four Members	34	17.2%
Five and More Members	58	29.3%
Total	**198**	**100.0%**
Number of adults over 18 years	**Number of Respondents**	**% of total**
One	50	25.3%
Two	103	52.0%
Three or more	45	22.7%
Total	**198**	**100.0%**

Table 4.2 presents a cross-tabulation to indicate the nature and adequacy of ventilation applied in the dwelling structures (or rooms). The findings indicate that 147 respondents (74.2%) reported to have adequate ventilations comprised of doors and windows (83.7%). On the other hand, 51 households (25.8%) reported that the ventilations are adequate, mainly served by doors only

(82.4%). In the cases where windows were used as ventilators, such windows are not framed to standard sizes but rather they are tiny and wooden in nature.

Table 4.2: Nature and Adequacy of Ventilations for Dwelling Structures

	Dwelling adequately ventilated		Not adequately ventilated	
Type of ventilation	**Responses**	**% of the total**	**Responses**	**% of the total**
Doors only	24	16.3	42	82.4
Doors and windows	123	83.7	9	17.6
Total	**147**	**100.0**	**51**	**100.0**

Poor ventilation impacts negatively on the health of the occupants especially considering that cooking is performed right inside the dwellings. Besides, the type and the size of the ventilation determine the speed at which the occupants would be able to escape during a fire outbreak. The past literature has also showed that an alarming number of deaths during fire incidences in informal settlements are due to smoke inhalation either during sleep or because they cannot swiftly escape upon a fire outbreak. The worst is expected to happen in a household that is not adequately ventilated. The carbon monoxide emitted by the smoke during fires circulates in the house as in most cases in the investigated area has shown insufficient ventilation in the households. The smoke will eventually block the breathing passage of the occupants and death may result in children and older people in most cases. Children are usually left with health problems. In incidences like these their defence mechanism is still not strong enough to withstand excessive smoke inhalation.

Table 4.3 shows the distribution of responses on the highest level of education attained by the sample respondents. The findings show that a majority of respondents (56.1%) had attained secondary level education, with 31.1% indicating they had attained primary level of education. A

partly 11.7% reported that they had college level. Empirical studies have shown that literacy levels are proportional to poverty levels and hence the level of vulnerabilities. The level of education of most respondents illustrates that they are aware of the risks, especially fire-related risks that their households could be exposed to. The ability to read and write is an important personal asset, allowing individuals increased opportunities in life. Knowing the distribution of the literate population can help programme managers, especially those in disaster management planning, to decide how to reach women and men with their messages.

Table 4.3: Highest Level of Education Attained by Sample Respondents

Highest Level of Education Attained	Responses	% of the total
Primary Level	61	31.1
Secondary Level	110	56.1
Tertiary College Level	23	11.7
University Graduate Level	2	1.0
Total	**196**	**100.0**

Exposure to hazards was noted by most vulnerability assessment models as a function of risk. The more exposed an individual or communities are the more vulnerable and at risk they are. Table 4.4 shows a multi response analysis on the distribution of responses on sources of energy for lighting. The findings indicate that a majority of the households rely on a combination of electricity (84.8%) and kerosene (66.7%) as major sources of lighting. First, it was notable during the field study that most of the household rely on shared electricity connections, with some having loose connections openly visible. Open flame is very dangerous more especially if it is based on a fossil fuel source such as kerosene, where combustibility level is too high. Study has shown that most fires in the Kibera settlements were caused by people knocking over kerosene lamps or from faulty electricity connections.

Table 4.4: Multiple Responses Analysis on Sources of Light Energy

Light Source	Responses (out of 198)	% of the total
Electricity	168	84.8
Kerosene	132	66.7
Charcoal	3	1.5
Gas	1	.5
Fire wood	1	.5

Table 4.5 shows a multi response analysis on the distribution of responses on sources of energy for cooking. The findings indicate that a majority of the households rely on a combination of charcoal (82.8%) and kerosene (77.3%) as major sources of cooking energy. With the levels of household income being low, most households are not able to afford modern advanced sources of cooking energy such as liquefied petroleum gas and electricity because they are beyond the financial reach of many. The majority of people using paraffin stand vulnerable to paraffin stove explosions rendering them vulnerable to fires. The charcoal stoves are used for cooking right inside the dwelling rooms leaving the occupants exposed to health hazards of excessive carbon monoxide inhalation as well as possibility of igniting open fires upon coming into contact with flammable materials therein. The sample respondents listed the following as the major sources of fire accidents within Kibera slums: faulty electricity connections; mishandling of stoves; unattended jikos; paraffin lamps; candles; and gas explosions.

Table 4.5: Multiple Responses Analysis on Sources of Cooking Energy

Source of Cooking Energy	Responses (out of 198)	% of the total
Charcoal	164	82.8
Kerosene	153	77.3
Electricity	44	22.2
Gas	19	9.6
Fire wood	6	3.0

4.3. Capacities to Reduce Fire-Related Hazards

The first research question sought to interrogate on specific capacities to reduce fire-related hazards that could be discovered among the residents of Kibera Slums. This section outlines some of the specific capacities identified from the sampled households. The issues are grouped into three broad categories namely: responsible handling of fire sources, institutional support, equipment, and social networks.

4.3.1. Responsibility of Handling of Fire Sources

The high number of households leads to emergence of several societal measures. Knowledge on possible sources of vulnerability to fire incidents is essential in preventing future fire incidents. Earlier findings (Table 4.3) showed that all the sampled respondent had attained basic level of education. The findings have shown that a large number of households have more than one occupant, with majority of such occupants being adults of over 18 years (Table 4.2). During fire incidents, adult members of the household play a critical role in raising the alarm, evacuating children and the aged, and in putting out the fire. The adult members also provide any necessary first aid care before rushing them over to the nearest medical facility for treatment. When prompted to report on the measures taken (or applied) by members of your households to reduce fire-related hazards, the household heads reported that the adult members of the households play an active role in sensitizing junior members on how to handle fire sources that have potential of igniting an open fire within the dwellings (e.g. stoves, candles and jikos).

4.3.2. Local Institutional Support

Local community-based institutions exist in Kibera to provide essential basic services and welfare for residents. Other notable institutions include schools, churches, clinics, and non-governmental organizations with active role in institutionalization of fire hazards prevention and

mitigation in the area. Schools/training and education facilities play a vital role to ensure that communities in Kibera are provided with relevant training and education to transfer skills, experience and knowledge of disaster risk management. Medical facilities such as clinics and local community health workers are needed to help the locals in administering medical assistance or emergency help. NGOs such as the Kenya Red Cross, St John's Ambulance and Africa Medical Research Foundation (AMREF) run sensitization drives towards fire hazards prevention and post incidents management of victims.

4.3.2. Tools and Equipment

The respondents were requested to indicate what equipment (or tools) that were available for use to put out fire or prevent it from spreading further during a fire incident. The query was an open response item. The responses reported included water, sand, blankets and heavy clothing, sacks especially old ones made from sisal, and long tree branches with leaves. The level of effectiveness of each item was assessed on a five-point scale. The findings are presented in Table 4.6 below. The findings indicate that according to a majority of the respondents; blankets and heavy clothing, and sand are the most effective tools applied to putout fire or prevent it from spreading further. All these materials are readily available from within the households.

Table 4.6: Effectiveness of Various Tools Used to put out Fire

	Not effective at all		**Fairly ineffective**		**No idea**		**Fairly effective**		**Very effective**		**Totals**
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	
Water	1	0.5	3	1.5	-	-	103	52.0	91	46.0	**198**
Blankets and Heavy clothing	-	-	1	4.7	-	-	11	52.4	9	42.9	**21**
Sand	-	-	7	6.8	-	-	66	64.1	30	29.1	**103**
Old sisal sacks	-	-	4	66.7	-	-	2	33.3	-	-	**6**
Long tree branches with leaves	-	-	-	-	-	-	-	-	3	100.0	**3**

The findings in Table 4.6 indicate that the sampled respondents rely on locally available and unconventional fighting tools during the fire outbreaks. All the 198 sampled households reported that the first line of action during a fire outbreak is to look for a water point or source, with 98% reporting that wetting the fire source is an effective approach. Following closely was 103 of the 198 households (representing 52%) who reported that they use sand when putting out fire during an outbreak, with 93.2% of them rating sand as a highly effective tool. Use of blankets and heavy clothing was cited by 21 of the 198 sampled households (representing 10.6%) with 95.3% of them rating the use of blankets and heavy clothing as a highly effective approach to putting out fire. Use of old sisal sacks was cited by six of the 198 sampled households (representing 3%), with four of the six rating the use of old sisal sacks as an ineffective means of putting out fire. Finally, three of the 198 sampled households (representing 1.5%) reported that they had effectively used long tree branches with leaves to put out fire during a past fire outbreak. The findings therefore indicate that other than use of water and sand, few households within Kibera slums are able to identify effective tools of putting out fire during an outbreak. This explains the extent of huge damage recorded on life and property every time there is a fire outbreak.

4.3.3. Social Networks

The increasing complexity of society and the intensity of the interactions between humans and their environment make us more vulnerable than ever to unexpected events. During fire emergencies in Kibera slums, there is a critical time constraint on evacuating affected people, locating and delivering available resources, as well as generating relevant information and distributing it to appropriate parties in a timely manner. Unity among the residents of Kibera to put off fire when an alarm has been raised about an outbreak has been of great importance in the management of past incidents. When the respondents were asked to state how they responded to the last fire alarm, the responses reported were varied. As shown in Table 4.7, 53.6% of the

respondents rushed to the scene on hearing shouts for help; 4% dialled for help from the fire brigade; 32.3% called up their neighbours to know of their whereabouts and if they were well; and 10.1% did not take a specific response action. This indicates the role that social networks play in management of fire disasters in Kibera.

Table 4.7: Responses by Residents during Fire Alarms

How did you respond to the last fire alarm?	Number of Responses	% of the total
Rushing to the scene on hearing shouts for help	106	53.6
I dialled for help from the fire brigade	8	4.0
I called up my neighbours to know of their whereabouts and if they are well	64	32.3
No specific response action taken	20	10.1
Total	**198**	**100.0**

4.4. Internal Measures to Reduce Residents' Vulnerability to Fire-Related Hazards

The second research question sought to interrogate the internal measures applied to reduce Kibera residents' vulnerability to fire-related hazards. At the household level, some of the measures noted from the respondents are documented in Table 4.8 below. Thirty five households were non-responsive in regard to the matter. The findings indicate that the measures reported by most respondents include: reserving handling of fire generating equipment (lamps and stoves) including cooking to adult members of the households (39.3%); putting off fires immediately after use (22.7%); and cooking from outside the living rooms (14.7%). Other measures reported from a few households include: exercising caution in handling of flammable materials and liquids (4.9%); installation of electrical safety devices e.g. circuit breakers (9.8%); allocation adequate space for the cooking area (2.5%); restrained movement of infants around the fire sources (3.6%); and sensitizing the young members of the household on personal safety measures when handling fire (2.5%). The findings indicate that the level of innovativeness on

fire hazards reduction among Kibera residents is still low at the household level. The households still apply obvious and old-age approaches to prevention of fire related hazards.

Table 4.8: Fire Hazards Reduction Capabilities at Household Level

What are some of the measures taken (or applied) by members of your households to reduce fire-related hazards?	Number of Responses	% of the total
Reserving handling of fire generating equipment (lamps and stoves) including cooking to adults members of the households	64	39.3
Putting off fires immediately after use	37	22.7
Exercising caution in handling of flammable materials and liquids	8	4.9
Installation of electrical safety devices e.g. circuit breakers	16	9.8
Allocation adequate space for the cooking area	4	2.5
Cooking from outside the living rooms	24	14.7
Restrained movement of infants	6	3.6
Sensitizing the young members of the household on personal safety measures when handling fire	4	2.5
Total	**163**	**100.0**

At the community level, some of the identified measures include: sensitizing the locals through chief's *barazas* on the possible causes of fire and how best they can be managed; encouraging parents and their children to be more cautious and responsible when handling electricity and inflammables; deterring construction of shelters and business structures along the access paths to aid in quick access by rescue teams and neighbours during a fire incident; sensitization on proper handling of highly explosive substances such as kerosene and liquefied petroleum gas; and teaching in local schools of junior members of the households on personal safety. A number of respondents reported that they had attended sensitization forums on how to avoid fire hazards and how to deal with putting it out in case of a breakout.

Despite the above measures, fire outbreaks are still common and too frequent in Kibera slums. One of the probable reasons is that the residents are not disciplined in the implementation of

these measures. For instance, residents located in the interior sections of the slums rely on illegally and loosely connected electricity for lighting. During daytime and early evenings, most of the household heads are away hence the use of stoves and jikos is delegated to other members of the households. This increases the risk of fires from unattended stoves.

4.5. Coping Strategies and Identifiable Sustainable Solutions

The third research question sought to interrogate the short-term and long-term coping strategies that have been used to bring sustainable solutions and incorporate fire disaster resilience and mitigation into actions and decisions among Kibera residents. Some of the short-term and long-term coping strategies identified and further elaborated below include: assistance from external actors; communication and early warning approaches; sensitization on personal and household safety measures; and comradeship.

4.5.1. Assistance from External Actors

The study sought to assess whether or not the respondents had got any assistance from the government or civic authorities or disaster management authority or any non-governmental organization, during a fire outbreak in a period going back to three years from the date of the study. The findings are outlined in Table 4.9 below.

Table 4.9: Level of External Assistance

Did you get state or institutional assistance during a fire outbreak in your area?	Responses	%
Yes	14	7.5
No	173	92.5
Total	187	100.0

Table 4.9 above shows that according to a majority of the respondents (92.5%), there had been no support from external actors such as the government, civic authorities, disaster management authority, or any non-governmental organization. The respondents lamented that the government is always slow and not willing to help. The fire brigade has always come but very late when fire has consumed everything or they didn't have access to the far interior parts of the slums. However, 14 households were affirmative that they have been receiving meaningful support from external actors. The few who received support said that the support came in form of foodstuff and blankets for them to be able to restart their livelihoods again. Others were given iron sheets and timber to reconstruct their structures after they were destroyed by fire. External actors are also responsible for public awareness campaigns.

4.5.2. Communication and Early Warning Approaches

The respondents were provided with five items among which they were requested to rank in order of importance in regards to how they are applied to disseminate fire alarms in Kibera. They included word of mouth (Screams); radio; television; mobile phone; and community settlements barazas. The findings are presented in Table 4.10 below.

Table 4.10: Ways of Disseminating Fire Alarms in Kibera Slums

	Responses ranking 1	% of the total	Responses ranking 2	% of the total
Word of mouth (screams)	193	97.5	0	0.0
Radio	3	1.5	195	98.5
Mobile phone	2	1.0	0	0.0
Total	**198**	**100.0**	**195**	**100.0**

The findings in Table 4.10 show that the respondents ranked word of mouth highest among the other options. Kibera community has no community sponsored radio station and use of mobile phones is limited to those who can afford to own one. However, everyone can scream. Word of

mouth seems to be the best way of disseminating fire warnings as most of the respondents said they heard the warning from neighbours or their children. The finding of the study is that fire warnings are fairly disseminated in this community by word of mouth. A gap between fire awareness campaigns and fire warnings should be bridged to mitigate the effect of fires.

4.5.3. Sensitization on Personal and Household Safety Measures

On a five point scale, the respondents were requested to indicate the extent to which various measures indicated had been enforced as a way of reducing residents' vulnerability to fire-related hazards. The findings of Table 4.11 indicate that minimal effort has been put in addressing each of the six highlighted issues. According to a majority of the respondents, very little has been done to enforce the following: choice of nature of construction material used for structures (90.9%); safety of power connections (89.4%); congestion on inter spacing between structures (98.0%); and encroachment of access roads (79.7%). However, moderate attention is made in regard to enforce the type of energy sources to use in lighting and cooking and handling of inflammable sources of energy such as kerosene and gas.

Table 4.11: Extent to which Mitigation Measures have been enforced

	Not at all		Fairly low		Moderate		Fairly High		Very High	
	n	%	n	%	n	%	n	%	n	%
Nature of construction material used for structure	56	28.3	124	62.6	17	8.6	1	0.5	-	-
Type of energy sources to use in lighting and cooking	7	3.5	46	23.2	109	55.1	34	17.2	2	1.0
Safety of power connections	104	52.5	73	36.9	20	10.1	1	0.5	-	-
Handling of inflammable sources of energy like kerosene and gas	2	1.0	23	11.6	67	33.8	73	36.9	33	16.7
Congestion – inter spacing between structures	128	64.6	66	33.4	4	2.0	-	-	-	-
Encroachment of access roads	69	34.8	89	44.9	36	18.2	4	2.0	-	-

According to the key informants interviewed, there is need to educate locals on the dangers of using illegally and poorly connected electricity. Also, there is need to educate pupils on the best ways of handling fire and teaching them appropriate first aid skills.

4.5.4. Promoting Comradeship Spirit among Kibera Residents

Considering that the assistance obtained from external actors is at minimal levels, there has been need for the residents to embrace comradeship in management and control of fire hazards. Further, when the respondents were asked if they knew of community-based or village-based fire management committees in the area, none seemed to have a clue on existence of such committees. No scheduling of formal meetings when villages experience fire disasters. They said they only gathered at the affected household and offered their assistance as a community of immediate neighbours. The finding of the study is that there is no real fire settlement committee in this area where the committee members discuss mitigation, preparedness and recovery measures in case of fires.

During the recovery period, the community members come to the rescue of the affected neighbours. According to the respondents, the help comes in various forms namely: providing assistance by donating basic needs; accommodating the victims; supporting them morally by giving advice and encouragement; helping them reach the nearest medical facility for treatment; helping them trace their missing kin; and assisting in salvaging what is not extensively damaged. The findings indicate the high level of social bonding amongst residents and the display of unity during fire emergencies.

CHAPTER FIVE: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1. Introduction

This chapter presents the summary of major findings, conclusions, and recommendations. The broad objective was to assess the fire hazards reduction capabilities in Nairobi's Kibera informal settlement. The study further sought to achieve the following specific objectives: to investigate how fire hazards are managed by the Kibera residents internally vis-à-vis externally by other actors; to investigate prospects for long-term strategies of fire hazard reduction that will bring sustainable solutions and incorporate disaster resilience and mitigation into actions and decisions; and to assess the level of capacity to reduce fire-related hazards among the residents of Kibera Slums. A field study was conducted in Kibera slums covering 198 households' heads and select key informants.

5.2. Summary of Key Findings

The study established that Kibera residents manage fire hazards using a two-pronged approach. First, hazards are managed at the household level. Second, hazards are managed at the community level which involves the immediate neighbourhood and other external actors. At the household level, the findings identified the following as the main approaches: reserving handling of fire generating equipment (lamps and stoves) including cooking to adults members of the households; putting off fires after use in the houses especially after cooking the meals to avoid any risk; taking extreme care to ensure the clothing and any soft flammable material around the stove or candles are secured from coming into contact with such fire sources; installing switches and circuit breakers on the electricity system to act as safety devices; allocating adequate space for stoves when one is compelled to cook from within the house; cooking from outside the living rooms to minimize the risk of igniting open fires; looking after the little babies and restraining

them from playing around open flames (lamps, candle lights, and stoves); teaching the young ones in the household how to handle appliances with care and in the right way especially when adult members are away; safe handling of explosive sources of fire such as gas cylinders. For instance, household members are encouraged to light the matchstick before opening the gas valve and completely closing the same after use.

At the community level (external actors and immediate neighbours), the findings identified the following as the major approaches: sensitizing the locals through chief's *barazas* on the possible causes of fire and how best they can be managed; encouraging parents and their children to be more cautious and responsible when handling electricity and inflammables; deterring construction of shelters and business structures along the access paths to aid in quick access by rescue teams and neighbours during a fire incident; sensitization on proper handling of highly explosive substances such as kerosene and liquefied petroleum gas; and teaching in local schools of junior members of the households on personal safety.

In line with the second specific objective and the third research question, the findings revealed a range prospects for long-term strategies of fire hazard reduction that will bring sustainable solutions and incorporate disaster resilience and mitigation into actions and decisions for Kibera residents. These include: assistance from external actors; communication and early warning approaches; sensitization on personal and household safety measures; and comradeship. External actors comprise of the government, civic authorities, disaster management authority, or any non-governmental organization. The respondents lamented that the government is always slow and not willing to help. The fire brigade has always come but very late when fire has consumed everything or they didn't have access to the far interior parts of the slums. The few who received support said that the support came in form of foodstuff and blankets for them to be able to restart

their livelihoods again. External actors are also responsible for public awareness campaigns. According to all the respondents interviewed, there have been no community public awareness campaigns on fire in Kibera in the past 12 months.

In regard to communication and early warning approaches, word of mouth featured as the best way of disseminating fire warnings as most of the respondents said they heard the warning from neighbours or their children. The finding of the study is that fire warnings are fairly disseminated in this community by word of mouth. In regard to sensitization on personal and household safety measures; the findings revealed that very little has been done to enforce a number of safety and standards measures namely choice of nature of construction material used for structures; safety of power connections; congestion on inter spacing between structures; and encroachment of access roads. Attention has however been directed into enforcing the type of energy sources to use in lighting and cooking and how to handle inflammable sources of energy such as kerosene and gas. As pertains to comradeship, the findings showed that community members come to the rescue of the affected neighbours. This help comes in various forms namely: providing assistance by donating basic needs; accommodating the victims; supporting them morally by giving advice and encouragement; helping them reach the nearest medical facility for treatment; helping them trace their missing kin; and assisting in salvaging what is not extensively damaged. This arises due to lack of organized structures of disaster management such as community welfare committees.

In line with the third specific objective and the first research question, the study was able to reveal the level of capacity to reduce fire-related hazards among the residents of Kibera Slums. The capacities were explored on the basis of three broad categories namely: responsible handling of fire sources, institutional support, equipment, and social networks. The findings have shown

that a large number of households have more than one occupant, with majority of such occupants being adults of over 18 years (Table 4.1). During fire incidents, adult members of the household play a critical role in raising the alarm, evacuating children and the aged, and in putting out the fire. The adult members also provide first aid services before rushing them over to the nearest medical facility for treatment. The respondents reported that the adult members of the households play an active role in sensitizing junior members on how to handle fire sources that have potential of igniting an open fire within the dwellings (e.g. stoves, candles and jikos).

Local community-based institutions exist in Kibera to provide essential basic services and welfare for residents. The findings showed that according to a majority of the respondents; water, blankets & heavy clothing, and sand are the most effective tools applied to putout fire or prevent it from spreading further. All these materials are readily available from within the households. During fire emergencies in Kibera slums, there is a critical time constraint on evacuating affected people, locating and delivering available resources, as well as generating relevant information and distributing it to appropriate parties in a timely manner. Unity among the residents of Kibera to put off fire when an alarm has been raised about an outbreak has been of great importance in the management of past incidents.

5.3. Conclusions

The study findings found that the majority of the people of Kibera live so far under the breadline. People struggle for daily survival and upkeep. Considering the level of poverty, crime and other pressing issues in this community preparing for fire disasters had proven to be last on the list of priorities in this community. Drawing from the findings of the study a worrisome number of respondents only had a wide door as an escape route despite the fires that have tormented and killed people in their neighborhoods in the past. Of the 198 households visited, none of them had two doors leading outside. Preparedness is part of disaster management and by observation it was not evident in

the community. In Kibera slums, the dwelling structures are so close to each other that when one burns runaway fire is a high possibility. No mitigation measures have been strictly enforced over the years.

The study findings found that as far as fire hazards reduction capabilities in Nairobi's Kibera informal settlement is concerned, the government and other external actors act as response units as they are only visible during the recovery stages. Externally fires are not properly managed in this community. The residents of Kibera seem clueless about disaster management, and they did not show any interest. Internally it seemed like the people have developed a dependency syndrome whereby they expect the government to do everything after fire incidents.

All of the respondents (100%) said they were not aware of any campaigns in their area to sensitize residents on proper fire handling practices. The study proved that there was a lack of awareness in this community as the majority of the respondents were not aware of any awareness campaigns. Word of mouth seemed to be the viable route for disseminating information in the community. This is because of the unavailability of a community radio station, and the high cost involved in investing in modern technological systems such as mobile phone-based alerting systems. Also, majority are not connected to electricity therefore access to powered media such as television is limited. Drawing from that, there is need for a mode of early warning information dissemination to be devised and be made sustainable. The study findings show that good strategies of disseminating information for mitigation are lacking.

Most of vulnerability assessment models perfectly link vulnerability with coping capacity stating that low coping capacity leads to more exposure which increases the vulnerability level of an individual household or entire community. The level of vulnerability of the investigated community was looked at based on their personal profile. Indicators such as gender, marital

status, age, level of education and the household size were explored in this study to better understand the vulnerability and the coping capacity of this community.

Household size increases the impact of fire hazards by increasing the number of vulnerable household members; according to the findings of the study (71.3%) of sampled households have three or more inhabitants in a one or two-roomed structure. This increases the number of people who are at risk in one household, therefore increasing the level of vulnerability of the community. The study found that the majority of the of the households with three or more inhabitants share a single or two room dwelling with one window for ventilation increasing their vulnerability to poisonous smoke inhalation and burning to death because of insufficient escape routes. Over crowdedness can increase the level of vulnerability, (29.3%) of the respondents indicated that more than five people make up their households. None of the respondents reported to be staying in a four roomed house or larger. According to the study household size is a predisposing factor to vulnerability of individuals in households to fire hazards.

Awareness is ripe amongst educated people naturally. This is due to their inquisitive minds of wanting to read anything they lay their hands on. According to the findings (Table 4.3), 87.2% of the respondents have up to secondary education, with more than half of them (31.1%) being primary school leavers. This finding shows that it is difficult for the majority in this community to have formal jobs with high paying salary to put down structural mitigation measures and it also renders them incapable of applying or understanding non-structural mitigation measures because of their literacy level. The aim of putting down mitigation measures is to reduce the impact of the hazard, reducing vulnerability in the process. Literacy level of Kibera residents renders them vulnerable to the fires ravaging their areas.

5.4. Recommendations

Based on the findings above, that reflect the negative impact of fires that ravage the people of Kibera slums, the following recommendations can be made:

5.4.1. External Support on Preparedness

Preparedness is necessary for disaster prevention and mitigation as it increases the capacity of communities and households to minimise the risk and impact of disasters. The national and County Government of Nairobi should help this community to prepare for fires by tasking the engineers and county planning office to come up with a disaster management and preparedness plan for all persons residing in informal settlements. The private and public sectors should take advantage of the new law on public-private partnerships to construct low cost housing units that meet modern standards. Improved livelihoods will increase the coping capacity of these people through enhanced standards of living. According to the sampled key informants, there is need for fully equipped fire stations that are strategically positioned in Kibera for faster and efficient service delivery (response) during a fire outbreak. The Government should also come up with a proper housing plan for Kibera. This will eventually reduce congestion of houses and hence facilitate easier and faster access of fire brigades in case of a fire outbreak situation. Proper management of electricity by Kenya Power should be done as a way to check electric system of Kibera and ensure that illegal tapping of power is completely stopped for better control of fire hazards. Persons engaged in illegal power connections should be prosecuted and fined or jailed.

5.4.2. Awareness

Considering the literacy level in this community, awareness campaigns should be carried out in a manner that everybody will be interested, if pamphlets are used they should be written in simple language and they must be pictorial to accommodate the majority who cannot read. The mode of early warning information dissemination should be by the use of loud hailers, as they tend to

reach large audiences and they are also known for drawing attention in communities. Word of mouth is only able to reach a fraction of the members of the community especially those within a few metres radius. There is also a need to educate pupils in schools on better measures that they can apply in their homes to prevent and control fire related hazards. In addition, there is need for educating the locals on the best ways possible to deal with the causes of fire and how best it can be managed after an outbreak.

5.4.3. Dependency syndrome

The government's and external actors' role in disaster management, is supposed to be facilitators rather than relief agents. One critique that has been made against the way in which the local government facilitation of participation has been implemented applies to this study. Bridger and Luloff (1999:268) argued that policies and programs that are designed to include and conform to community norms and desires are formulated outside the community, and therefore there is still often little regard for local circumstances with limited participation of community members in decision-making. The study has found that community members, especially those affected by fire hazards are not engaged in decision-making. There is need for the government and other external actors to consult widely with the community as targets of beneficiaries as this could exacerbate the unbalanced relationship between them and community members.

5.5. Areas for Further Research

The study established that the involvement of external actors in management of fire disasters is minimal. Further research may be conducted to establish the role of external forces in bringing sustainable solutions, disaster resilience, and mitigation into actions and decisions among dwellers of informal settlements in Nairobi. The study also found that the community relies on traditional tools for managing a fire disaster, with limited success. Further research may be

conducted to assess how modern tools of disaster management can be incorporated to the management of fire disasters within the Kenyan informal settlements.

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KIAMBATISHO I: BARUA YA KUJIJULISHA

Ruth N. Kamengere
Chuo Kikuu cha Nairobi,
Kitivo cha sanaa,,
Idara ya Sosholojia
S.L.P 30197-00100,
Nairobi.

Tarehe 17 Julai, 2013

Kwako Mhojiwa..

MINT: UTANGULIZI WA MWANAFUNZI WA UTAFITI

Mimi ni mwanafunzi wa shahada ya uzamili katika Chuo Kikuu cha Nairobi kutafuta Shahada ya Masters Sanaa, katika Sosholojia. Ili kutimiza sehemu ya shahada yangu ninafanya karatasi ya mradi: "**KUTATHMINI UWEZO WA KUPUNGUZA ATHARI ZA MOTO KATIKA MAKAZI YA KITONGOJI DUNI CHA KIBERA**".

Ningeshukuru iwapo ungetenga dakika chache wa muda wako ili kujaza pengo zilizoachwa wazi katika orodha ya masharti na maswali kwa kadri ya ujuzi wako kama inavyodhihirika kwako au kwa jamaa yako. Habari katika dodoso hili litawekwa kwa usiri na hakuna popote pale jina lako litatajwa katika mifano kwa utafiti huu. Aidha, taarifa hii haitatumika kwa matumizi nyingine yeyote mbali na minajili ya utafiti huu. Msaada wako katika kuwezesha hayo yote itakuwa yenye kukubaliwa.

Asante.
Wako Mwaminifu.

_____

RUTH KAMENGERE (Mwanafunzi wa Masters Sanaa)

KIAMBATISHO II: RATIBA YA MAHOJIANO KWA WAKUU WA JAMII

Kusudi la mahojiano ni kutathmini uwezo wa kupunguza athari za moto katika makazi ya kitongoji duni cha Kibera Nairobi. Tafadhali tusaidie kwa kutoa majibu ya maswali machache.

Tarehe _____ / _____ / 2013 Serial No _____

SEHEMU A: MAELEZO YA NAFSI

1. Majina (Hiari) _____

2. Jinsia a) Mwanaume ☐ b) Mwanamke ☐

3. Umri a) hadi miaka 25 ☐ b) 26-35 miaka ☐ c) 36 - 45 miaka ☐
d) zaidi yamiaka 45 ☐

4. Hali ya ndoa a) Peke yangu ☐ b) Katika ndoa ☐ c)Hali ya kutengana ☐
d) Hali ya talaka ☐ e) Mjane ☐

5. Jumla ya idadi ya watu katika boma hili _____

6. Idadi ya watu wazima zaidi ya miaka 18 _____

7. Ni nani ambaye anategemewa katika jamii ? a) Binafsi ☐ b) Mama ☐ c) Baba ☐
d) Wazazi ☐ e) Nyingine (taja) _____

8. Jinsi chumba chako kilivyo gawanywa? a) 1 chumba ☐ b) 2 vyumba☐ c) vyumba vitatu na zaidi ☐

9. Je nyumba yako inaingiza hewa ya kutosha ili kuthidibiti hali?) a) Ndio ☐ b) La ☐

10. Ni aina gani ya uingizaji hewa iliyo kwa nyumba yako / muundo ? a) Mlango pekee ☐
b) Milango na Madirisha ☐ c) Nyingine (taja) _____

11. Ni nini hali ya ukaazi wako katika hii nyumba?

a) Nyumba / muundo ya binafsi☐ b) mpangaji ☐ c) Nusu-mpangaji ☐

d) Mke wa nusu-mpangaji ☐ e) Rafiki ya nusu-mpangaji ☐

12. Ni dakika ngapi za kutembea, ambazo wewe huchukua kutoka nyumba yako hadi upate barabara kuu? Dakika _____

13. Ngazi ya juu ya elimu uliyofikia ni? a) Msingi ☐ b) Sekondari ☐ c) Elimu ya juu ☐

d) Chuo Kikuu cha kuhitimu ☐ e) Chuo Kikuu Uzamili ☐

14. Jumla ya mapato ya jamii kila mwezi (shilingi ngapi?) _____

15. Hali ya ajira a) Mfanyakazi wa Kawaida ☐ b) Mfanyakazi rasmi (mkataba) ☐ c) Mwajiriwa rasmi (za kudumu) ☐ d) Waliojiajiri ☐ e)Bila ajiriwa ☐ f) yinginengine (Tafadhali taja) _____

16. Umeishi katika mtaa wa mabanda wa Kibera kwa muda gani? a) Miezi _____ au (b) miaka _____

17. Unatumia nini kuleta mwanga ama kawi ya joto? (Jibu zote zinazotumika)

a) gesi ☐ b) mafuta ya taa ☐ c) Moto kuni ☐ d) Mkaa ☐ e) Umeme ☐

f) Wengine (TAJA) _____

18. Ni nini chanzo yako kuu ya nishati kwa ajili ya kupikia? (Jibu zote zinazotumika)

a) gesi ☐ b) mafuta ya taa ☐ c) Moto ya kuni ☐ d) Makaa ☐ e) Umeme ☐

f) Nyingine (TAJA) _____

SEHEMU B: HABARI JUU YA KUPUNGUZA ATHARI ZA MOTO

19. Je, nyinyi (au majirani) mshawahi kuwa waathirika wa kuzuka moto katika siku za hapo hawali? a) Ndiyo ☐ b) La ☐

Kama NDIO, ni wangapi katika miaka mitatu iliyopita na ni hatua gani mliochukua kukabiliana na hasara baada ya matukio?

a) _____

b) _____

c) _____

d) _____

e) _____

20. Je, wewe unafikiria kuwa ni nini chanzo kikuu cha matukio ya moto ndani ya mitaa ya mabanda ya Kibera?

a) _____

b) _____

c) _____

d) _____

e) _____

21. Ni zipi baadhi za hatua zinazochukuliwa (au kutumiwa) na wanachama wa jamaa yako kwa kupunguza athari zinazo husiana na moto?

a) _____

b) _____

c) _____

d) _____

e) _____

22. Kwa viwango vipi vya hatua vilizotajwa katika swali 21, ndivyo ambavyo vilikuwa na ufanisi katika kuzuia hatari ya moto kati ya jamaa yako na majirani? 5)Ufanisi sana 4)Ufanisi kiasi 3) Hakuna wazo 2) Sio ufanisi kiasi 1) Sio ufanisi kabisa

Kupima	**5**	**4**	**3**	**2**	**1**
a)	☐	☐	☐	☐	☐
b)	☐	☐	☐	☐	☐
c)	☐	☐	☐	☐	☐
d)	☐	☐	☐	☐	☐
e)	☐	☐	☐	☐	☐

23. Katika tukio la athari ya moto, ni vifaa gani (au zana) munavyopatikana navyo kwa ajili ya matumizi ya kuzima moto au kuizuia kuenea zaidi?

a) _____

b) _____

c) _____

d) _____

e) _____

24. Kwa kiwango gani vifaa au zana zilizotajwa katika swali 23 hapo juu, zimekuwa na ufanisi katika kuzima moto kwa jamii au jirani yako hapo siku za nyuma? 5) ufanisi sana 4) ufanisi kiasi 3) Hakuna wazo 2) sio ufanisi kiasi 1) Sio ufanisi kabisa

Vifaa / zana	**5**	**4**	**3**	**2**	**1**
a)	☐	☐	☐	☐	☐
b)	☐	☐	☐	☐	☐
c)	☐	☐	☐	☐	☐
d)	☐	☐	☐	☐	☐
e)	☐	☐	☐	☐	☐

25. Je, mulipata msaada wowote kutoka kwa mamlaka ya serikali au ya kiraia au usimamizi wa maafa ya mamlaka au shirika lolote ya mashirika yasiyo ya kiserikali, wakati wa kuzuka moto katika eneo lako wakati wa miaka mitatu iliyopita?

a) Ndiyo ☐ b) La ☐

Kwa kifupi elezea majibu yako

_____

_____

26. Je, kuna kamati ya moto katika kijiji la eneo lako? a) Ndiyo ☐ b) La ☐

27. Kumekuwepo na kampeni zozote za jumuia katika uhamasishaji juu ya moto hapa Kibera katika miezi 12 iliyopita? a) Ndiyo☐ b) La☐

Kama NDIO, ni zipi baadhi za masomo muliyojifunza?

_____

28. Ni jinsi gani kengele ya moto husambazwa katika Kibera? (Panga kulingana ya umuhimu) a)Maneno ya mdomo (Mayowe) _____ b) Redio ____ c) Televisheni _____ d) simu ya mkononi ___e) Jumuiya ya mabaraza _____ f) Hakuna wazo _____

29. Mulikabiliana jinsi gani na kengele ya mwisho ya moto?

_____

_____

30. Ni kwa kiwango gani , hatua zifuatazo zimetekelezwa kama njia ya kupunguza hatari za wakaazi zinazohusiana na moto? Kiwango cha 5 = Juu sana, 4 = Juu kiasi, 3 = Wastani, 2 = Chini kiasi, 1 = Hakuna kabisa

	5	**4**	**3**	**2**	**1**
a) Hali ya vifaa vya ujenzi kutumika kwa ajili ya muundo	☐	☐	☐	☐	☐
b) Aina ya vyanzo vya nishati kwa kutumia katika taa na kupikia	☐	☐	☐	☐	☐
c) Usalama wa kuunganisha moto	☐	☐	☐	☐	☐
d) Utunzaji wa vyanzo vya kuchomeka vya nishati kama mafuta ya taa na gesi	☐	☐	☐	☐	☐
e) Msongamano - baina ya nafasi kati ya miundo	☐	☐	☐	☐	☐
f) Uvamizi wa barabara za kuingia	☐	☐	☐	☐	☐

31. Ni hatua gani unayoweza kuweka katika nafasi ya kusaidia jamaa yako (au majirani) ili kukabiliana na hasara unaosababishwa na tukio la moto?

a) _____

b) _____

c) _____

d) _____

e) _____

32. Ni hatua gani ya muda mrefu ambayo umezingatia kuhakikisha kwamba jamaa yako haitathiriwi na mazingira magumu kutokana na matukio ya kuhusiana na moto?

a) _____

b) _____

c) _____

d) _____

e) _____

33. Mapendekezo gani ungeweza kupeana kuhusu kupunguza hatari ya moto katika makazi duni ya Kibera?

_____

_____

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_____

_____

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_____

_____

_____

ASANTE KWA MUDA WAKO NA MAJIBU

KIAMBATISHO III: KIONGOZA MAHOJIANO KWA WATOA HABARI WAKUU

Madhumuni ya mahojiano haya ni kutathmini uwezo wa kupunguza athari za moto katika makazi ya kitongoji duni cha Kibera, Nairobi. Tafadhali tupatie majibu ya maswali machache tuliyo nayo.

Tarehe _____ / _____ / 2013 Serial No _____

1. Jina (Hiari) _____

2. Jinsia _____

3. Shirika _____

4. Wajibu _____

5. Uzoefu katika msaada wa maendeleo ya jamii _____ miaka

6. Ni uwezo ipi maalum inayopunguza hatari zinazokuhusiana na moto tunazoweza kuvumbua miongoni mwa wakaazi wa kitongoji duni cha Kibera?

_____

_____

_____

_____

_____

_____

_____

_____

_____

7. Je, ni hatua zipi za ndani ambazo hutumika ili kupunguza mazingira magumu kwa wakaazi wa Kibera katika athari zinazohusiana na moto?

_____

_____

_____

_____

_____

_____

_____

_____

_____

8. Ni mikakati zipi za muda mfupi na pia za muda murefu zilizo tumika kukabiliana pia kuleta ufumbuzi endelevu na kuingiza ujasiri wa kukabiliana na maafa ya moto na kwa matendo na uamuzi kati ya wakazi wa Kibera?

_____

_____

_____

_____

_____

_____

_____

_____

9. Mapendekezo gani ungeweza kupeana kuhusu kupunguza hatari za moto katika makazi duni ya Kibera?

_____

_____

_____

_____

_____

_____

_____

_____

ASANTE KWA MUDA WAKO & MAJIBU

APPENDIX I: LETTER OF INTRODUCTION

Ruth N. Kamengere
University of Nairobi
Faculty of Arts
Department of Sociology
P.O. BOX 30197 – 00100
Nairobi

November 24, 2014

Dear Respondent,

REF: INTRODUCTION AS A RESEARCH STUDENT

I am a postgraduate student at University of Nairobi pursuing a Masters of Arts Degree in Sociology. As part of partial fulfillment I am conducting a project paper on: **"ASSESSING FIRE HAZARDS REDUCTION CAPABILITIES IN NAIROBI'S KIBERA INFORMAL SETTLEMENTS"**. For this reason I would appreciate if you would kindly spare a few minutes of your time to fill in the blanks in the attached list of questions to the best of your knowledge as they apply to yourself or your household. The information in this questionnaire will be treated with confidentiality and in no instance will your name be mentioned in this research. In addition, the information will not be used for any other purpose other than for this research. Your assistance in facilitating the same will be highly appreciated.

Thank you in advance.
Yours Faithfully

_____

RUTH KAMENGERE (MA Student)

APPENDIX II: INTERVIEW SCHEDULE FOR HOUSEHOLD HEADS

The purpose of the interview is to assess fire hazards reduction capabilities in Nairobi's Kibera informal settlements. Please provide us with answers to a few questions.

Date _____/ _____/ 2013 Serial No. _____

SECTION A: BACKGROUND INFORMATION

1. Names (Optional) _____
2. Gender a) Male ☐ b) Female ☐
3. Age a) up to 25 years ☐ b) 26 – 35 years ☐ c) 36 – 45 years ☐
   d) Above 45 years ☐
4. Marital status a) Single ☐ b) Married ☐ c) Separated ☐ d) divorced ☐
   e) Widowed ☐
5. Total number of persons in the household _____
6. Number of adults above 18 years _____
7. Who is the breadwinner for the household? a) Self ☐ b) Mother ☐ c) Father ☐
   d) Both parents ☐ e) Other (specify) _____
8. How big is your house / structure? a) 1 room ☐ b) 2 rooms ☐ c) 3 rooms & above ☐
9. Is your house adequately ventilated? a) Yes ☐ b) No ☐
10. What type of ventilation do your house/ structure have?
    a) Door only ☐ b) Doors and Windows ☐ c) Others (Specify) _____
11. What is your residence status in this house/ structure? a) Own house/ structure ☐
    b) Tenant ☐ c) Sub-tenant ☐ d) Spouse of Sub-tenant ☐ e) Friend of sub-tenant ☐
12. How many minutes of walking does it take from your house to the nearest major access road? _____ Minutes
13. Highest level of education attained a) Primary ☐ b) Secondary ☐
    c) Tertiary college ☐ d) University graduate ☐ e) University postgraduate ☐
14. Level of household monthly income in Kshs _____
15. Nature of employment a) Casual employee ☐ b) Formal Employee (contractual) ☐
    c) Formal Employee (permanent) ☐ d) Self-employed ☐ e) Not employed ☐
    f) Others (Please specify) _____
16. How long have you lived in Kibera slums?
    a) _____months or b) _____ years

17. What is your main source of power for lighting? **(tick all that apply)** a) Gas ☐ b) Paraffin ☐ c) Fire wood ☐ d) Charcoal ☐ e) Electricity ☐ f) Others (Specify) _____

18. What is your main source of energy for cooking? **(tick all that apply)** a) Gas ☐ b) Paraffin ☐ c) Fire wood ☐ d) Charcoal ☐ e) Electricity ☐ f) Others (Specify) _____

SECTION B: INFORMATION ON FIRE HAZARDS REDUCTION

19. Have you (or neighbours) been a victim of fire outbreaks in the past?

    a) Yes ☐ b) No ☐

    If YES, how many in the past three years and what measures did you apply to cope with the losses after the incidents?

    a) _____
    b) _____
    c) _____
    d) _____
    e) _____

20. What do you consider to be the major sources of fire incidents within kibera slums?

    a) _____
    b) _____
    c) _____
    d) _____
    e) _____

21. What are some of the measures taken (or applied) by members of your households to reduce fire-related hazards?

    a) _____
    b) _____
    c) _____
    d) _____
    e) _____

22. To what extent have the measures mentioned in Q21 above been effective in preventing fire hazards among your household and neighbours? 5) Very effective 4) Fairly effective 3) No idea 2) Fairly ineffective 1) Not effective at all

Measure	**5**	**4**	**3**	**2**	**1**
a)	☐	☐	☐	☐	☐
b)	☐	☐	☐	☐	☐
c)	☐	☐	☐	☐	☐
d)	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐

23. In the event of a fire hazard, what equipment (or tools) are available to you for use to putout fire or prevent it from spreading further?

    a) _____

    b) _____

    c) _____

    d) _____

    e) _____

24. To what extent has the equipment or tools mentioned in Q23 above been effective in putting off fires at your household or your neighbours in the past? **5)** Very effective **4)** Fairly effective **3)** No idea **2)** Fairly ineffective **1)** Not effective at all

Equipment/ tools	**5**	**4**	**3**	**2**	**1**
a)	☐	☐	☐	☐	☐
b)	☐	☐	☐	☐	☐
c)	☐	☐	☐	☐	☐
d)	☐	☐	☐	☐	☐
e)	☐	☐	☐	☐	☐

25. Did you get any assistance from the government or civic authorities or disaster management authority or any non-governmental organization, during a fire outbreak in your area during the past three years?

    a) Yes ☐ b) No ☐

Briefly explain your response _____

_____

_____

_____

_____

_____

26. Is there a village fire committee in your area? a) Yes ☐ b) No ☐
27. Have there been any community public awareness campaigns on fire in Kibera in the past 12 months? a) Yes ☐ b) No ☐

    If YES, what are some of the lessons learnt? _____

    _____

    _____

    _____

    _____

28. How is fire alarm mainly disseminated in Kibera? **(Rank by order of importance)**

    a) Word of mouth (Screams) _____ b) Radio ____ c) TV _____ d) Mobile phone ___

    e) Community settlements barazas _____ f) No idea ☐
29. How did you respond to the last fire alarm?

    _____

    _____

    _____

    _____

30. To what extent have the following measures been enforced as a way to reduce residents' vulnerability to fire-related hazards? Rate 5 = Very High 4 = Fairly High 3 = Moderate 2 = Fairly low 1 = Not at all

	5	**4**	**3**	**2**	**1**
b) Nature of construction material used for structure	☐	☐	☐	☐	☐
c) Type of energy sources to use in lighting and cooking	☐	☐	☐	☐	☐
d) Safety of power connections	☐	☐	☐	☐	☐
e) Handling of inflammable sources of energy like kerosene and gas	☐	☐	☐	☐	☐
f) Congestion – inter spacing between structures	☐	☐	☐	☐	☐
g) Encroachment of access roads	☐	☐	☐	☐	☐

31. What immediate measures do you put in place to support your kin (or neighbours) to cope with the loss occasioned by a fire incident?
    a) _____
    b) _____
    c) _____
    d) _____
    e) _____
32. What long-term measures have you put in place to ensure that your kin are less vulnerable to fire-related incidents?
    a) _____
    b) _____
    c) _____
    d) _____
    e) _____
33. What recommendations would you make regarding reduction of fire hazards in Kibera slums?

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THANK YOU FOR YOUR TIME & RESPONSES

APPENDIX III: INTERVIEW GUIDE FOR KEY INFORMANTS

The purpose of this interview is to assess fire hazards reduction capabilities in Nairobi's Kibera informal settlements. Please provide us with answers to a few questions we got.

Date _____/ _____/ 2013 Serial No. _____

1. Name (Optional) _____
2. Gender _____
3. Organization _____
4. Designation _____
5. Experience in community development support _____ years
6. What specific capacities to reduce fire-related hazards can we discover among the residents of Kibera Slums?

   _____
   _____
   _____
   _____
   _____
   _____
   _____
   _____
   _____

7. What are the internal measures applied to reduce Kibera residents' vulnerability to fire-related hazards?

   _____
   _____
   _____
   _____
   _____
   _____
   _____
   _____
   _____

8. What short-term and long-term coping strategies have been used to bring sustainable solutions and incorporate fire disaster resilience and mitigation into actions and decisions among Kibera residents?

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9. What recommendations would you make regarding reduction of fire hazards in Kibera slums?

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THANK YOU FOR YOUR TIME & RESPONSES

APPENDIX IV: TABLE OF RANDOM NUMBERS

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All of the sampling plans presented in this handbook are based on the assumption that the packages constituting the sample are chosen at random from the inspection lot. Randomness in this instance means that every package in the lot has an equal chance of being selected as part of the sample. It does not matter what other packages have already been chosen, what the package net contents are, or where the package is located in the lot.

To obtain a random sample, two steps are necessary. First it is necessary to identify each package in the lot of packages with a specific number whether on the shelf, in the warehouse, or coming off the packaging line. Then it is necessary to obtain a series of random numbers. These random numbers indicate exactly which packages in the lot shall be taken for the sample.

The Random Number Table

The random number tables in Appendix B are composed of the digits from 0 through 9, with approximately equal frequency of occurrence. This appendix consists of 8 pages. On each page digits are printed in blocks of five columns and blocks of five rows. The printing of the table in blocks is intended only to make it easier to locate specific columns and rows.

Random Starting Place

Starting Page. The Random Digit pages numbered B-2 through B-8. You can use the day of the week to determine the starting page or use the first page for the first lot you test in a location, the second page for the second lot and so on moving to the following page for each new lot.

Starting Column and Row. You may choose a starting page in the random number table and with eyes closed, drop a pencil anywhere on the page to indicate a starting place in the table.

For example, assume that testing takes place on the 3rd day of the week. Start with Table 3 of Appendix B. Assume you dropped your pencil on the page and it has indicated a starting place at column 22, row 45. That number is 1.

If 1-digit random numbers are needed, record them, going down the column to the bottom of the page and then to the top of the next column, and so on. Ignore duplicates and record zero (0) as ten (10). Following on from the last example, these numbers are 3, 2, 9, 8, etc. If two-digit random numbers are needed, rule off the pages, and further pages if necessary, in columns of two digits each. If there is a single column left on the page, ignore this column, and rule the next page in columns of two. Again, ignore duplicate numbers and record 00 as 100. For example, using the same starting place as in the last example (Table 3, column 22, row 45), the recorded two-digit recorded numbers would be 11, 34, 26, 95, etc.. When three-digit numbers are needed, rule the page in columns of three. Record 000 as 1000. Starting on Table 3, column 22, row 45, the recorded numbers would be 119, 346, 269, 959, etc..

TABLE 1 - RANDOM DIGITS

11164	36318	75061	37674	26320	75100	10431	20418	19228	91792
21215	91791	76831	58678	87054	31687	93205	43685	19732	08468
10438	44482	66558	37649	08882	90870	12462	41810	01806	02977
36792	26236	33266	66583	60881	97395	20461	36742	02852	50564
73944	04773	12032	51414	82384	38370	00249	80709	72605	67497
49563	12872	14063	93104	78483	72717	68714	18048	25005	04151
64208	48237	41701	73117	33242	42314	83049	21933	92813	04763
51486	72875	38605	29341	80749	80151	33835	52602	79147	08868
99756	26360	64516	17971	48478	09610	04638	17141	09227	10606
71325	55217	13015	72907	00431	45117	33827	92873	02953	85474
65285	97198	12138	53010	94601	15838	16805	61004	43516	17020
17264	57327	38224	29301	31381	38109	34976	65692	98566	29550
95639	99754	31199	92558	68368	04985	51092	37780	40261	14479
61555	76404	86210	11808	12841	45147	97438	60022	12645	62000
78137	98768	04689	87130	79225	08153	84967	64539	79493	74917
62490	99215	84987	28759	19177	14733	24550	28067	68894	38490
24216	63444	21283	07044	92729	37284	13211	37485	10415	36457
16975	95428	33226	55903	31605	43817	22250	03918	46999	98501
59138	39542	71168	57609	91510	77904	74244	50940	31553	62562
29478	59652	50414	31966	87912	87154	12944	49862	96566	48825
96155	95009	27429	72918	08457	78134	48407	26061	58754	05326
29621	66583	62966	12468	20245	14015	04014	35713	03980	03024
12639	75291	71020	17265	41598	64074	64629	63293	53307	48766
14544	37134	54714	02401	63228	26831	19386	15457	17999	18306
83403	88827	09834	11333	68431	31706	26652	04711	34593	22561
67642	05204	30697	44806	96989	68403	85621	45556	35434	09532
64041	99011	14610	40273	09482	62864	01573	82274	81446	32477
17048	94523	97444	59904	16936	39384	97551	09620	63932	03091
93039	89416	52795	10631	09728	68202	20963	02477	55494	39563
82244	34392	96607	17220	51984	10753	76272	50985	97593	34320
96990	55244	70693	25255	40029	23289	48819	07159	60172	81697
09119	74803	97303	88701	51380	73143	98251	78635	27556	20712
57666	41204	47589	78364	38266	94393	70713	53388	79865	92069
46492	61594	26729	58272	81754	14648	77210	12923	53712	87771
08433	19172	08320	20839	13715	10597	17234	39355	74816	03363
10011	75004	86054	41190	10061	19660	03500	68412	57812	57929
92420	65431	16530	05547	10683	88102	30176	84750	10115	69220
35542	55865	07304	47010	43233	57022	52161	82976	47981	46588
86595	26247	18552	29491	33712	32285	64844	69395	41387	87195
72115	34985	58036	99137	47482	06204	24138	24272	16196	04393
07428	58863	96023	88936	51343	70958	96768	74317	27176	29600
35379	27922	28906	55013	26937	48174	04197	36074	65315	12537
10982	22807	10920	26299	23593	64629	57801	10437	43965	15344
90127	33341	77806	12446	15444	49244	47277	11346	15884	28131
63002	12990	23510	68774	48983	20481	59815	67248	17076	78910
40779	86382	48454	65269	91239	45989	45389	54847	77919	41105
43216	12608	18167	84631	94058	82458	15139	76856	86019	47928
96167	64375	74108	93643	09204	98855	59051	56492	11933	64958
70975	62693	35684	72607	23026	37004	32989	24843	01128	74658
85812	61875	23570	75754	29090	40264	80399	47254	40135	69916

APPENDIX V: THE RESEARCH PERMIT

PAGE 2

THIS IS TO CERTIFY THAT:
Prof./Dr./Mr./Mrs./Miss/Institution
Ruth Nyakio Kamengere
of (Address) University of Nairobi
P.O Box 30197-00100, Nairobi.
has been permitted to conduct research in

Location
District
Nairobi County

on the topic: Assessing fire hazards reduction capabilities in Nairobi's Kibera informal settlements.

for a period ending: 31st October, 2013.

PAGE 3

Research Permit No. *NCST/RCD/14/013/1406*
Date of issue *30th July, 2013*
Fee received *KSH. 1000*

Applicant's Signature

For Secretary
National Council for Science &Technology